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LOYALTY GROUP

1938

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ORNITHOLOGICAL SUMMARY OF

LIFU ISLAND

LOYALTY GROUP

1938

Orig. mapam file

BY

L. MACMILLAN

ORNITHOLOGICAL SUMMARY OF LIFU IS.

(LOYALTY GROUP) W. PACIFIC

L. MACMILLAN 1938.

for Dr. E. Mayr, A.M.N.H.

No. 1.

BRIEF GEOGRAPHICAL & GENERAL DESCRIPTION OF LIFU IS.

Lifu Is. is in the Loyalty Group, and a dependency of New Caledonia, from which it is governed through a local resident magistrate assisted by a gendarme. It lies roughly between $20^{\circ} 41'$ and $21^{\circ} 11'$ south latitude and $167^{\circ} 1'$ and $167^{\circ} 30'$ east long. (Greenwich). It is very irregular in shape and by no means occupies all the area between these degrees, the greater part of the NE quarter of the area being sea and a great deal of the SW and W part also is sea.

The island was originally called Chabrol, I believe by the first man to sight its north coast. This was, I believe, D'Urville, or Bougainville, one of the early French explorers in the area, but he did not come very close to it. He it was who discovered and named Beupre Is., sighted and named the chain of Islands of Uvea Is. the Pleiadies, only sighting the northern chain of them, and also sighted and named Uvea Is. which he called Haglan Is. (E.M. verify, Commander Erskine's Cruise).

The island as regards naming has suffered under a great disability where any names of points and so are are concerned. The native language has many sounds impossible for the French to say (English "th" being one of them) and very easy for English speaking peoples to say, the natives of the island pick up English very quickly and speak it very well. Actually many words of English are now incorporated into the native tongue as their own, almost

all articles they buy in stores having English names, knife, fork, spoon, plate, blanket, ring and so on. The bulk of the natives believe the words are their own and are amazed at how an English man can so quickly pick up so many words of their language. The earliest traders in search of sandal wood, and the earliest settlers and missionaries were all British and gave English names to all the principal physical features but the French have in the majority of cases altered these, in some cases different French officials having named the same point half a dozen times; to make matters even more confusing each official has his own way of spelling the sounds he cannot say, seldom recognising that what he thinks is a native name is really an English name. Some rather amusing instances have occurred over this spelling, the register of villages showing far more villages on the island than there really are as some villages are named three times because of differences of spelling. This causes great confusion as regards village and poll tax as the administration in Noumea used in the old days to keep enquiring why nonexistant villages had not paid their tax since the last resident left the island and no longer appeared on the roll.

The island has few prominent physical features and in many cases great confusion as to just where a named point really is exists today. The coastline generally speaking is a series of long curves and sweeps which make it difficult to define any definite alteration with the result that there are many spots or points on the island where names cove close together or a number of names are in use for the same spot. To avoid confusion as much as possible in the following summary I have in every case where there is more than one name in use used the native name and way of spell-

ing, thus avoiding the confusion caused by trying to write the names by French spelling. An example of this is the bay and village in the north called by the natives Thocking and spelt and said by French in either of the two ways as Docking or Douking. Another case is the village of Nandu, which French say and spell as Nado, Nangdo and Nandou. Actually the phonics are straightforward, Nan as in Nancy (English girl's name), du as in duty.

The island is hard to describe as regards shape but is not unlike a sea bird with a short tail sitting on a nest and facing to the west. The longest measurements are roughly about 30 miles in a NNW and ESE direction by about 27 miles in a W by N and E by S direction, in the southern part, as it were the body of the bird, which is the widest part of the island.

The northern part of the island has two main features, the Bay of Thocking and the long wide point or promontory running out the west which has no general chart name, though it has many French ones, is referred to by the natives as the Siloam or Siluam district. It was once called, even by natives, Amy Martin Point after an English vessel of that name which was wrecked on the point in the forties of last century; this name now only appears on French charts as applying to one small point on the promontory and far from where the vessel was wrecked. The same promontory forms the northern side of the largest bay of Lifu and which still carries its old name of Sandal Bay, bestowed on it by early sandal-wood traders from Australia. It is sometimes called Wide Bay by natives from a name bestowed by Commander Erskine, of the Aust. Naval State, in the late forties of last century, and the old missionaries are probably responsible for keeping the name alive with the natives in preference to the other which was inclined to be too reminiscent

of a period of lawlessness they preferred the natives to forget. Sandal Bay opens out to the west and is really more of a wide shallow indentation or sweep in the coastline being about 9 miles across the sea end and about 8 miles in depth from a line drawn between the two points which form its wide entrance. It affords little shelter and though it is studded with coral patches a little below the surface at low tide, it is generally speaking too deep for anchoring, except on one small submarine shelf in the north, and is a bad holding ground. It affords little shelter at any time. The southern side of Sandal Bay is formed by a small point, barely perceptible in the wide sweeping coast except from the sea immediately opposite it, which at present is called Lefevre Point. The whole southern coastline is more or less straight and is in much of its length a sheer cliff about 80 to 100 ft. high falling direct to the sea. The west coast of the island has only two distinct or definite features, a small point in the central south jutting out for a short distance and called Cape Pine because of a small forest of New Caledonian pine trees (Araucaria cooki) growing thereon, and a wide shallow indentation in the coast south centre of the island called Chateaubriand Bay which is of little use as an anchorage except for small craft, as it is very shallow and has many reefs, or the sea floor drops off very steeply to considerable depths. In the north there is an indistinct point called Cape Bernardin on charts but locally this name is unknown and generally the area and point are called Nanemwata, if the point is mentioned though generally speaking it is not given the status of a definite point.

In the interior there are few outstanding features, almost the whole interior of the island being one more or less level plain from 80 to 100 ft. above sea level. One or two small abrupt out-

crops which have at one time been islands appear at wide intervals, mostly close to the coast and never more than 100 ft. higher than the surrounding plain and often less. These outcrops are always flat or table-topped and seldom are than a few acres in extent. They play no part in the bird life of the island as the vegetation on them is identical with the surrounding bush at lower levels. There are a very few small caves in their steep sides which bats frequent but I saw no signs of swifts using these as nesting sites. Parrot finches nest in and about them a great deal but to no greater extent than they do elsewhere on the island. These abrupt outcrops do not represent more than 2% of the surface area of the island.

About 8% of the island is a low sea level coastal flat. This coastal flat is for the most part narrow and of little account and is in many places in its greater part subject to sea inundation at times of hurricane. Much of the vegetation on it is a low stunted wind blown scrub except along the immediate foot of the cliffs at its inner edge where coconuts and normal height trees grow and thrive on the water seepage from the plateau above. Only in one area about the head of and along the south side of Chateaubriand Bay does this coastal strip reach any width and there in one or two spots it is about half a mile wide though the average width is not more than a quarter of a mile. From there south the coastal flats extend in a more or less unbroken line about 2 hundred yards wide to the SE corner of the island, but in most places half of it is bare coral rock subject to inundation by waves in even a moderate sea. Owing to the narrowness of this coastal strip it plays no part in the bird life of the island, though the steep cliffs at the landward edge are full of caves and these are much frequented

by swifts, owls, and parrot finches for nesting or roosting. Insectivorous bats are also common in these caves.

The greater part of the island surface area, fully 90%, is a more or less level plateau with a very mixed vegetation. The plain is generally speaking only a shallow layer of soil over coral rock or is soil held in deeper pockets in the underlaying coral rock. There is no regular or striking feature through the whole area and the country is monotonous in its sameness. Every where throughout the plain irregularly but never far apart coral dykes or outcrops occur, seldom being more than a foot or more above the surrounding plain and more often only a matter of inches higher.

Nowhere on the island do collapsed caves occur though caves are present under the ground as can be seen by the vegetation and by the hollowness underfoot when a car crosses these areas. It is likely the soil of the Lifu plain is in the same stage as the middle of the three uplifts of Mare Is. and has not yet been subject to sufficient leaching of the lime out at the coral rock to weaken it sufficiently to cause collapse. There are in one or two places caves in this level plain which opened up to the surface like quarries and numbers of smaller ones which go down to sea level and consequently have water in the bottom of them. These smaller holes are really pot holes in the coral rock and except near the entrance are very dark and narrow. In the centre of the island where water is scarce the natives have dug out narrow tracks in the soapy coral rock of the sides and go up and down them for water for domestic purposes. Many of the holes are not straight and in some places the natives have now commenced or have sunk wells straight down to the water chamber and put a winch and bucket to work. Only within the last year or two have they realised that

water is to be had almost all over the island by sinking to sea level through the porous coral rock.

The vegetation is very varied all across this plain and there are no definite zones of one particular type which extend unbroken for any distance. This will be dealt with in the next section.

As regards fertility the island is badly off, it is more fertile than Uvea but is not as fertile as Mare, and the most fertile parts of the island would not represent more than at the very most 20% of the fertility of a really tropical island fertility of quite ordinary class. Lifu has about one tenth of the fertility Tanna in the N.H. has, and no island in the N.H. is as infertile as Lifu. There is a small degree of fertility in the soil but it is quickly exhausted and takes some years to recover from even the lightest cropping.

There are no rivers anywhere on Lifu and surface water of any sort is non-existent. Even after heavy rain, water does not remain on the road surfaces for more than a day or so. There are no areas of swamp whatever or areas growing swampy grass. There is no true clay soil on the island and only in one small strip is any other than a pure coralline detritous soil found.

The island is very healthy little or no filariasis being present and in every case I enquired into this disease had been contracted in New Cal. or Uvea. Mosquitoes are almost entirely absent and there is no malaria or anopheles present as far as I could discover. Venereal disease introduced from Noumea is common but is being got in hand by the local Protestant Mission hospital and medical service in a worthy manner. The administration have

recently established a hospital and are now also doing good work. Unfortunately they elected to place their hospital right alongside the old established mission one and consequently the whole island is not properly covered and cases at a distance are difficult to treat. The present doctor and the mission have opened up car roads over most of the island and consequently there has been a considerable improvement in medical service. Also telephones are being placed all over the island and the doctor may be called in case of necessity. T.B. is an introduced disease which is taking heavy toll on the island. Leprosy is also present and only recently has segregation been enforced, since when a decided improvement has taken place in the number of new cases occurring.

The temperature is fairly even and does not vary much. In summer for short periods it may reach 90°F. but for most of the hot season remains in the eighties during the day and drops to the top seventies at night. In the cool season, in fact during at least nine months of the year the temp. remains in the seventies during the day and in the sixties, or even down to 54°F. occasionally, and commonly in the upper fifties during the night. The nights on the west side of the island are several degrees cooler than the nights on the east coast unless a westerly is blowing as the cooler night air over the land seems to have more of a general drift to the west.

Rainfall varies between 30 and 50 inches a year but is more commonly between 38 and 42 inches per annum. Droughts are not uncommon and appear to go in cycles of about every 8 years. In one of these in recent times (records were kept from the sixties of last century till the last of the English missionaries left in 1915 but a gap then appears till 1933 when the local postmaster

and wireless officer began keeping them again) only 14 inches were recorded for the year. The soil dried up and all shallow rooting vegetation suffered greatly or died but the tall trees seemed not to suffer to any great extent, possibly being sufficiently deep rooted to obtain sufficient moisture at great depths.

The total population at the last census in 1934 was five thousand eight hundred and fifty nine (male ad. 1643; female ad. 2280; Juveniel 1936.) In 1938 from the missionary rolls I go the following totals. Protestant: ad. m. 1112; ad.f. 1726; imm. 1842. total 5684. Catholics: ad.m. 180, ad.f. 340; imm.80; total 600. The Catholic total I checked up myself from the government rolls and found to be 40 too many men and 45 too many children and 5 too few women. The Protestant rolls were correct as regards men and children, I did not check the females. Thus the revised grand total if the Prot. women are correct as I believe they are, is 6204. The population was up over the six thousand four hundred in 1937 but two epidemics caused a heavy mortality, especially amongst the Catholic section who did not have as good a medical service as the Protestants and would not go to the government hospital at that time.

The natives are a friendly industrious people and have greatly improved their houses and mode of living and are sure from now on to increase rapidly as they have got over the first shock of contact with civilization.

THE PROBABLE GEOLOGICAL FORMATION OF LIFU ISLAND.

Taking a general survey over Lifu island it is seen that it is a two stage uplift island, intermediate between Mare (3 stage) and Uvea (1 stage), and probably lifted at coinciding periods. As on

Mare it was noticable that the last uplift stage appeared to have taken place soon after the second stage as the third stage which is now the coastal flat area, is everywhere comparatively narrow. So on Lifu the last uplift stage which really forms the second uplift stage of that two stage island is also a narrow coastal strip, showing lack of time for it to have grown to any large extent. Uvea being of course a one stage island is as yet equivalent to the wide central plain of Mare and Lifu, portion of the plain as yet being under water and forming the floor of the lagoon. As a matter of actual fact all the Loyalty Islands should be given one more stage than I have given them as there are the small abrupt outcrops which were once islands above the sea on a wide circle of coral reef exactly as Beupre island is today, but these outcrops are of such small area that I have left them out, but they definitely show the progressive stages of the formation of the Loyalty group. All the Loyalties are formed on a parallel range of mountains to the mainland of New Cal. and roughly parallel the Chain Central of that island. Soundings show a valley between the two ranges which appear to run together well up to the NW of the northern extremity of New Cal. A somewhat similar but smaller formation is to be seen about the area between the Isle of Pines and the southern reefs of N.C. The existence of the Tanna or New Hebrides deep is known of lying somewhere to the west of Tanna Is. But its extent is as yet undefined though it is known that it does not extend far south of Aneityum, it possibly passes more westerly than the line of the New Heb. and is somewhat like a very deep trench to the north of the Loyalties. This deep is undoubtedly caused by block faulting and the block on which the Loyalties are is riding up on that on which the N.H.

are. The absence of the frequent and severe earth tremors felt in the N.H. in the Loyalties seems to bear out the presence of a distinct line of cleavage which acts as a shock absorber between the two areas. If the Loyalty area is the one which is rising one would expect to find the islands at the eastern end of that group to have been further raised than the more western ones and the northern ends of the islands to be generally higher than the southern parts and such is the case. Mare is the highest with actually four stages of uplift and even the remains of the mountain peak about which the coral lagoon formed still plainly visible at Rawa on that island. This peak on Mare I believe has never been under the sea. Lifu the next island to the west shows only faint traces of the peak on which the coral formed and this peak was probably barely on the surface and has certainly at some stage been under the sea. The rising of the block of land in the east giving Mare its first stage of uplift brought another peak in the submarine range near enough to the surface to let the coral polyps commence forming Uvea, on which island there is no sign of the soil of the peak on which it formed. This peak is probably still well below the sea-level. Beaupre is at even an earlier stage and the Petrie reefs further west are as yet not even one stage above the sea. All of these are undoubtedly on peaks of the same mountain range. To the east of Mare two other peaks of this mountain range show, which probably because these peaks are at a much lower level than the Mare and Lifu peaks (from the earth's centre) have formed comparatively recently as the rising of the land mass has brought them sufficiently near the surface for the coral polyps to commence their building activities. These

two peaks are shown by the Durand reef and Walpole Is. Actually I believe soundings about Walpole Is. would reveal that there was an extensive peak thereabouts and Walpole and the Durand reef and some other banks there which I have seen breaking in rough weather are all founded on the same peak and in time this area will form up into a large lagoon much as Beupre Is. is today, with Walpole in the place of Beupre on the lagoon's margin and Durand reef much as Tonga-tabu is on the Beupre lagoon today. Mathew and Hunter islands further east are, I believe, on the other side of the fault and more rightly belong to the New Heb. land mass and the presence of actual volcanic action there today seems to further point to this as nowhere in the N.C. area is actual active volcanic action or vents present today.

As one would expect this mountain range to run in a more or less straight line corresponding to the N.C. mainland and roughly equidistant and that the coral polyps would do more extensive work in the lee of the base peak and the first forming coral, I applied this theory to Lifu Island and near the village of Nadu in the south centre of that island and sunk a hole. At 6 ft. under the surface after going through rotten and soft coral rock I found pure red volcanic loam identical with that at Rawa on Mare Is. When the natives realized what I was looking for they showed me places where the loam came within a few inches of the surface and close to the abrupt outcrops in the south I found it actually on the surface but showing signs of having been under the sea. Natives told me of places where it did not show signs of having been under the sea but I saw none and have grave doubts if there are any such places as the two I examined which they thought had not been submerged showed distinct signs

of submersion and the coral overlay had been carried away. It is worth mentioning that this area of the island carries the densest garden culture of the island and is the most fertile and productive. It has long been recognised by the natives as the most fertile and best garden area of the island, they having long had a law prohibiting the planting of coconuts in the area as such would alienate the land as regards garden cultivation. Also it is very noticeable that there are no tall trees anywhere in the area, the gardening activities are so constant and the rotation cycle so short that nowhere in the area is the secondary growth more than 6 to 8 ft. in height. The natives speak of the yams that come from this area as being the best on the island, and some natives pay considerable amounts for the right of making gardens in the area. Much of the land of this sort belongs to natives living on the east coast at Wai, Nassa, and such villages and they nearly all have gardens in the better soil. They have temporary houses and even villages near these gardens and live there during the intensive gardening season and at other times live there during the week and go back to their east coast villages on Saturday returning to the garden villages on Monday morning. The natives told me that some time before they had tried to dig a well in this area and expected to find water at the same depth as elsewhere on the island but though they went far beyond the usual depth no water was found. On questioning they said the soil remained the same all the way down but that all the rocks (floaters), they found were quite different to the rocks on the rest of the

island. One native volunteered the information that the rock was "All same stone belong Caledonia." I made inquiries further north but could find no indication there of any volcanic soil being found at greater depths when wells were being sunk. In the extreme north at a village called Nachoam natives told me that years ago when a well was being sunk at a village which is no long in existence, at a point midway between Nachoam and Thocking, they found no water but at a great depth they found different soil which from descriptions they gave may have been volcanic, though they said the soil was not the same as the soil near Nandu in the south.

The area as far as I could establish in which this volcanic soil is found in the south is a long strip, nowhere very wide, lying along a line a little behind the line of abrupt coral outcrops in the south of the island, and in the exact direction in which the range of mountains on which the Loyalties have formed must lie. This soil is undoubtedly the more or less even crest of a long section or top of a mountain of that range, probably a razor-back ridge maintaining an even height for a considerable distance. It appears as if the distance this ridge was at about sea level was for about 16 miles though in one spot there appears to be a distinct break for about two miles but it is more than likely if a shaft were sunk in that section it would be seen that only a thin layer of coral rock over-burden or growth would have to be penetrated, possibly up to 50 ft., till pure volcanic soil was once again reached.

From the foregoing it appears as if there is little doubt Lifu Is. formed on a peak in the south and a large

lagoon formed to leeward of this; possibly in the north another lagoon began to form on another peak and became incorporated in the southern lagoon. The few reef patches off the north and NW of Lifu which I have included in my sketch map would seem to point to this being the case. There are many other uncharted reefs in the area just north of island one about 8 miles due north of Escarpe Pt., I know of, as the cutter on which I came from Uvea had to weather it in the dark, does not appear on any charts, and there are others to the NW which are still uncharted. Most of these reefs are known to the native captains of the small cutters which trade between Lifu and Noumea.

It is worth mentioning that exactly in the line in which the lagoon must have formed on the southern peak, and for that matter the northern peak, there is a strong current flowing NW, a half knot current and constant. This current may of course have formed after the island formed but even if so would from the very beginning tend to draw the island out along the lines it has assumed.

SUB-AREAS & VARIATIONS OF SOIL & VEGETATION.

Actually Lifu cannot be properly split up into subdivisions as the only two variations as regards altitude are of such small area that they are of no account on the island. Soil shows only the two variations, one being of such small area that it is of no real consequence and as it is under intense garden culture it forms an unnatural area and is not allowed to develop any vegetation features of its own. Also as regards vegetation differences it is impossible to split

the island up into any separate areas as the different types of vegetation alternate so much and are so confused and only in one or two areas do they assume even fair-sized areas of one type that any dividing of the island up is almost impossible and would only lead to confusion. The native garden culture and the infertility of the soil making it necessary to have large areas under cultivation annually to maintain the large population has caused this state of affairs. As women have long outnumbered men and it is the women who do the greater part of the garden work and take a greater interest in agriculture it is natural that the tendency has been towards larger and larger areas under cultivation. Year by year and the increasing population has further intensified this. Another factor has been the occurrence of droughts which have tended to make the natives plant a greater area than necessary in normal years as they never know when a drought will occur and estimate their wants by drought year production. A further influence in this direction is the head tax which all natives have to pay annually to the administration and these taxes increase with the island's wealth. Also as the natives' wants as regards European goods increase they need more and more wealth to supply them and as the only crop which will do well on the island and be permanent is coconuts they put more and more land under these year by year and alienate such areas from garden culture and have consequently to be ever clearing new areas of virgin land to supply their garden needs. They are an industrious and

independent race and young single women even at a very early age begin cultivating areas of their own and attain independence and means of their own. Thus the result has been a regular patch work of cultivation all over the island, which has originally been carved out of one type of country and vegetation, the original tall forests of the island. The natives of Lifu, having always had to live nearer the starvation line than the natives of Mare and to be more careful as regards garden lands and the fertility of the soil, have never been careless with fire as the Mare natives have and the consequence is that the original forests of Lifu are more or less intact and in their old state.

(Natives have told me it requires about 40 acres of garden under that year's culture to maintain a married man and one or two young children per year and besides this a man must have bananas and so on in his last year's garden which must consequently be at least under light cultivation. He must also have a fair areas under coconuts, probably 30 to 40 acres at the very least, to supply the money for his taxes and needs as regards European goods, clothing, food-stuffs, tobacco etc. Natives are not allowed to grow their own tobacco, though it grows well and is of fair grade, as the French Government monopoly in this article rules in all French colonies also.

At one time cotton was grown a great deal and because of the dryness at the right season a very high quality staple was produced. The slump in the price of this commodity and the non-withdrawal of the heavy tax on its export from the island, probably an oversight on the administration's

part, has caused the production of this commodity to almost entirely disappear and today there is not more than a hundred or two pounds per annum exported, and what little there is is almost entirely produced by the lepers in the leper colony.

Maize is also grown for export and is increasing in quantity but the trade in this was long strangled by the large profit taken by the local trader and a small government export tax. Comparatively recently the natives have owned their own cutters and now carry their produce to Noumea in their own craft and sell in the open market, generally through the British Consul. and thus get much fairer prices and cut out the middleman's profit. For the same reason I believe the cotton production will again increase as the administration will take the present tax off as the product cannot stand boom-time taxes.)

As will be seen Lifu cannot be properly sub-divided so I will only briefly mention the different area divisions and describe the different types of vegetation that occur on the island and it may thus be understood that in almost every area on the island all types of habitat may be found in a very short distance and are irregular in their occurrence and sequence.

The three physical divisions on the island are on the three uplift levels, the very small area on top of the abrupt coral outcrops, which being identical with the vegetation of the main plain and nowhere more than 100 ft. above it and generally less, can be safely and correctly considered as part of the main plain for bird purposes. The main central

plain which is, except for one narrow strip in the central-south, all one type of soil and a very varied patchwork of various types of vegetation. The small soil variation area in the centre-south can be left till the description of the vegetation as it is entirely given over to agriculture and though a different soil has no characteristic to separate it from the rest of the main plain. The third physical division is the coastal flat which is everywhere narrow and in most places exceedingly narrow. Much of this coastal flat is bare coral rock or a very low stunted scrub only a foot or two in height and only near the inland cliffs does the vegetation grow to normal height. Much of the inner parts of the coastal area have been planted up by the natives with coconuts and about villages and for some distance on either side, often completely connecting the villages, the vegetation is purely coconut palms with a few small shrubs and brush growing in between. At no place in the coastal flat areas does the vegetation vary sufficiently from that of the main plateau to be worth mention, and though more sandy and generally shallower and less fertile, showing more recent submersion under the sea, the soil does not vary to any large degree to that found on the main plateau of plain.

THE MAIN CENTRAL PLAIN OF LIFU.

This comprises the greater part of Lifu Is., forming fully 90% of the area of the island and even the remaining 10% is very similar and except for the bare coral rock and low scrub at the immediate sea-coast cannot be separated from it except to say that the height of the trees is generally much less.

The whole central plain varies only 40 ft. in its height above sea level and in nearly every case these variations are too gradual to be noticed. The soil over the whole area, except for the small strip of volcanic loam in the south, is a coral line soil composed of the weathered and decomposed coral rock mixed with sand and rotted leaves and vegetable matter. In places where the humus content is high a certain low degree of fertility exists but, because of the shallowness of the soil and its exposure to the sun, when under cultivation quickly loses its fertility and quickly becomes exhausted. In these places also before the forest is cleared the soil becomes almost clayey but on exposure quickly bakes into a hard surface and soon powders up and becomes dust and blows away. On roads with much traffic it packs down hard but in hot dry weather soon wears down into a trench. In wet weather it is exceedingly slippery and under much rain gets very soft but within a few hours it is hard again in exposed places such as roads.

In pockets where soil has accumulated a fair depth of soil is found varying in depth according to the original pothole in the old reef top. These potholes vary in area from a foot and less across to several acres or more in area, but nowhere does their presence show on the surface, that being more or less level, except in one or two places in every few square miles where an extra large pothole is present, often 150 yds. or more across and with steep cliff like sides, sometimes as much as 20 ft. in height though more often only 3 to 6 ft. in height. These potholes are favourite sites for gardens and are much sought after and

produce very good crops, especially in times of drought as they are generally moister and get some drainage from the higher levels, they also have a greater depth of soil than usual on the island and are sheltered from drying winds to a larger extent. In some places these potholes are consecutive, only a barrier of coral rock a few feet wide separating one from another, in such places they are less fertile and productive than elsewhere and the soil is generally much shallower. But these potholes total only a very small percentage of the area of the island.

The greater part of the island is covered with a depth of soil from 2 to 18 inches in depth or is pure coral rock right on the surface. It is amazing to see how the vegetation can grow in the cracks and cavities of this rock but all of it except the deep rooting varieties quickly dries up in dry weather. The administration have followed the lead of the early Protestant missionaries in encouraging the natives to plant Cadjan or Pidgeon Pea in old gardens and in areas where the coral rock is on the surface and this does well on the phosphates in the rock and not only enriches the soil but is definitely helping to more rapidly break up the rock and cause its decomposition. Areas which a few years ago were no good for gardens are now under cultivation because of this and though they do not yield as well as other areas and suffer in the periodical droughts they at least yield a little and in time will become cultivation areas.

In the areas of original forest the soil in type and depth is the same as elsewhere except that it is more damp and fertile.

Throughout the whole island coral dykes occur but are seldom more than a foot above the surrounding level of the soil and in the greater number of instances, probably 80%, are only just level with or an inch or two above the soil. These coral dykes are present under the soil also and in planting the natives consider their presence and never plant deep rooting crops over them. Before planting a native explores the soil in wet weather by probing with a thin charred hardwood stick and marks the run of these ridges. If original forest is to be planted generally some exploring thus is done before the site for the garden is selected.

Coconuts can be planted in a small hole in the pure coral rock and do quite well and also help to break the rock up. Generally speaking the natives have confined their planting of coconuts to the more rocky spots so as not to alienate good garden lands but some natives have not been as long-sighted as this and have used the better quality lands. As far as I could see there was little or no difference in the yields produced except that the palms in the better grade soils come into bearing at an earlier date, in five to seven years instead of seven to nine years.

Nowhere on the island could I find a true clayey soil, though in the volcanic area in the south there is a type of volcanic clay which though not a proper clay seems suitable for such birds as need this article for nest building.

On the east coast just south of the Cape Pine there is a small area which at one time was a tidal lagoon arm and, though there is now no swamp or surface water present, in

wet weather the surface forms a kind of clayey slurry which birds use for nest building. In some places on the island the birds have used the ordinary calcareous loam general to the whole island for their nest building but seem to be very particular about the puddles they take it from.

Thus it will be seen that the greater part of the island is the same and there is little variation from end to end of it as regards the surface, which is a varying depth of the one kind of soil or pure coral rock outcrop, and only in the one small volcanic area is there any real difference.

VEGETATION:

ORIGINAL FORESTS:

The original forests of Lifu are fairly regular in their characteristics, almost the only variation being in the amount of coral-rock birds-nest fern growing on the ground. In places where rock dykes occur or the underlying stratum of rock comes close to the surface, which it does almost all over the island except in the surface, which it does almost all over the island except in the small deeper pockets, the fern grows densely and decreases according to the amount and nearness of the coral rock, till in a more fertile pocket of some depth it is almost absent entirely. The trees on Lifu grow very large and I was puzzled to understand why this was so as they were considerably larger than the trees on the more fertile island of Mare investigation led me to the conclusion that moisture was the governing factor. On Mare the trees were growing on a plain 100 ft. more above sea level than on Lifu and considering the porous

nature of the soil the water would quickly soak far beyond the reach of the roots of the trees and come out at sea level, as it does, and the long dry periods which the all islands of the Loyalties experience would tend to stunt the trees. On Lifu the water can be got at from 60 to 100 ft. from the surface almost anywhere and the rock of the island being coral and more or less a soapy stone full of cavities offering easy passage for the roots of plants, the trees have put down scout roots and have reached the permanent water which more or less corresponds to the sea level under most of the island. They have thus a constant water supply and are not affected by the long dry spells and consequently reach a large size. The only well I had myself lowered down seemed to bear this out, as I found that 60 ft. down in it and about 4 ft. above the surface of the water roots coming out of the face of the well and continuing on down the open face to the water. These roots were alive and though very small doubtless capable of drawing moisture for the parent tree. I brought some to the surface and natives, who in these matters are very observant and reliable, after examining them for a moment pointed to a tree growing about 20 ft. to the side of the well and by no means the nearest tree and said they were the roots of that species. In another place in a cliff-face where I examined a cave I found live tree roots which must have come through at least 70 ft. of coral rock to reach the roof of the cave in which I stood. I do not believe the roots of these trees go much beyond 100 ft. down as it is noticeable that on the small abrupt coral outcrops which reach as much as 200 ft. A.S.L. the

trees are very much smaller and more approximate the size of the trees on Mare Is. in such places as they have not been damaged by fire on that island. Once this is realised it is easy to understand why Lifu has a higher forest level as regards the tops of the trees than any other Loyalty island. Uvea has a higher general level in its forest than Mare probably for the same reason, but in the case of Uvea the water becomes possibly brackish and the root system must be limited in its downwards expansion as the fine rootlets cannot live very far under the water level.

The tallest trees on Lifu reach 100 ft. in height, and the upper leaf canopy in original forest averages at least 80 ft. above the ground. Many of these are soft wood trees and a great number are pacific teak. Banyans in competition with these grow also to great heights but are straggly and every subject to great limbs breaking off them from sheer weight and length of limb. There are numbers of trees, large and small, in these forests the names of which are unknown to me though the trees themselves are well known to me and are common in other islands of the western Pacific. It is noticeable that the tree which is commonest on the highest plateau of Mare is very rare on Lifu and it is very doubtful if this species of tree could compete with the higher growing trees of Lifu as it seldom grows above 40 ft. in height. In the Lifu forests there is an upper leaf canopy varying from 60 to 100 ft. and averaging about 80 ft. above the ground. Below this and in some place actually joining up with it is another canopy varying from 40 to 60 ft. above the ground. This secondary canopy is generally not very

dense but is a distinct level or zone in the forest and is everywhere discernible in original forest and in some places fairly thick. It is not caused by a lower level of trees only but may be seen on the tallest trees which run on up to greater heights. The only reason I can see for this peculiarity is that the 40 ft. above ground level represents the period of the trees' growth when its roots first reach the water underground and this extra stimulus causes a secondary layer by increasing the trees' ability to branch out. Why the same degree of branching ability should not be carried on evenly to the top of the tree I do not know. Nor is the level of this secondary layer in the tall trees, as far as can be ascertained by guess work, controlled by the depth at which the water must be, though this may be accounted for by the ease with which the roots can penetrate the cavities in the coral rock and the varying rates of growth of the different species of trees.

Below this second canopy there are the usual shorter types of secondary trees and shrubs, the former forming a rather thin and open layer, hardly sufficiently thick to call a canopy, at a height up to about 20 ft. from the ground, the latter forming a more or less continuous leaf area with it from about 3 ft. above the ground upwards. On the large trees themselves and up to varying heights are one or two kinds of parasitic creepers, mostly the common broad deeply serrated leaf type which is common in almost all tropical forests. On the ground the coral rock birds-nest type of fern along with creepers hold almost complete sway, only in areas where the soil is deep do these not grow and according to the absence or presence of coral rock are they

dense or thin. Throughout the forest areas of Lifu vines and creepers are prolific, one type of creeper probably the most prolific of the lot has been introduced from elsewhere. This vine which is simply running riot all over the island and even spoiling cultivations and areas under coconuts unless constantly watched and cut back was introduced by a native who noticed that the blue berries of this vine could be made into quite a passable ink for writing purposes. This vine today supplies an enormous amount of food to bird life on the island all fruit eaters feed on it and where the fruits become over ripe they attract insects, also the dense blanket of leaf and vine rope it makes, almost a mat, is conducive to the causing of rot and its attendant insect life which come to feed on the rotting wood or to breed in such places. Though this vine is an unchecked pest in the Loyalties, being present on Uvea also to which island it was introduced from Lifu, it is also present in the New Heb. but must have some insect control there, as it is not a serious pest as it is becoming in the Loyalties. It does appear to get somewhat out of hand in new coconut plantations in the New Heb. but once cattle are allowed into the coconuts the vine quickly disappears. As regards cattle control the same applies in the Loyalties but it is in gardens that the vine is serious, yet in the N.H. it never becomes a pest in gardens. There are numbers of other native vines in the forest the usual kinds found in coral rock soils and a little convolvulus in one two of the more fertile places but these are very stunted and are nowhere thick.

Another slightly lower forest is found but it so closely resembles and is so mixed up with the taller forest that it is not worthy of a class of its own as habitat. It is identical

in all but height with the tall forest, and the fact that it has more banyan trees per square mile and a slightly denser underbrush in some little spots is purely due to the fact that more light can penetrate to the lower levels and the banyans do not have to grow to such unusual heights to compete for existence. There is little difference in the soil they grow in though there is probably a slightly higher percentage of coral rock in the lower areas of forest, but this is by no means a regular feature or a reliable guide.

These tall forest or original forest habitats are found all over the island and are frightfully mixed up in various sized areas with all other types of habitat. Only in the extreme north, an area in the centre (rather long and narrow and running north and south) in the SW corner of the island are any areas of any considerable extent now found which are unbroken stretches.

NATURAL LOW TREES AND GRASS OR LOW SHRUBS (ALMOST A STUNTED SAVANNAH TYPE OF HABITAT)

This type of country occurs irregularly all over the island and in very abrupt changes from tall forest or other types of habitat, just as if a knife had been dividing the country. They undoubtedly show the presence of caves under ground and are seldom very extensive in unbroken area though often a consecutive series of them occur with only a narrow division of some other type of habitat in between. Today it is easy to confuse old garden areas with this type of country but there is one infallible sign and that is that there are always Morie trees (a species of hard-wood acacia) on this type of country and they are numerous and stunted and gnarled showing age, whereas on old garden lands they are seldom present and when they are they are few and though as tall or taller than those on the other type of country they invariably

are much younger and sappier in growth and show a much straighter growth and cleaner bark. On this savannah type of country the grass sometimes grows up to three feet and very thick (a type of red grass) but it dries off very rapidly in dry weather. Most of the grass is thin and stunted on these areas and such shrubs as do grow there are seldom more than three feet high and very stunted and appear to have to struggle for existence. The soil in these places is seldom very deep but even when it is the plant life does not appear to do very well. Natives seldom if ever use these sites for gardens as, though they would present an easy clearing problem at the outset, they would yield very poorly except in the wettest of years.

LOW DENSE TANGLED SCRUBS WHICH MAY BE INDIGENOUS BUT ARE PROBABLY AN INTRODUCED TREE.

This tree though the natives declare it is a native to the island is I believe introduced, though it is very likely it was introduced a long time ago. It never grows above a height of 15 ft. and is very dense and tangled. It appears to be some sort of pretosprum but is light green and has a smaller leaf. (I am probably quite wrong in calling it this but I do so because the leaves are sticky like the pretosprum when crushed and smell like it.) The scrub seems to grow on almost any kind of land which has been cultivated and exhausted by cropping and is thus common close about native villages. It does not appear to improve the soil at all and only after many years are gardens in the areas where it grows worth making. It is generally left close about villages as it makes good cover for areas in which natives can make their latrines. About villages where the soil is poor it now occupies large areas but it is seldom met with in extensive areas at any distance from villages. As the soil

under it slowly regains its fertility of taller types of trees, which at first have a hard struggle to establish themselves, get through to the light and from then on grow normally and as they begin to branch and throw a wider shade this type of scrub slowly disappears, it being unable to grow in the shade of taller types. This shrub drops its leaves and makes quite a carpet on the ground but it appears to slightly poison the ground as other things do not seem to grow in its leaf-mould. In the course of time this leaf mulch becomes fertile and doubtless helps to increase the depth of soil on the island as it is a heavy leaf dropper. Though plants do not seem to relish the mulch of this scrubby tree's making, insects seem to revel in it and in the rough bark of the tree and consequently it forms a large food area for insectivorous birds. Its low tangled mass also supplies ideal nesting sites for many species of birds.

CULTIVATION HABITATS.

GARDEN LANDS.

This type of habitat is the same on Lifu as on all other islands except that the gardens in fallow show a greater number of stages as the rotation practised on the quickly exhausted soil of Lifu is at much longer intervals than usual. Natives seldom use the same site for a garden in under fifteen years except in the richer volcanic soil of the southern part of the island. Thus one sees second growth in anything up to 25 different stages of growth as a limited number of areas are not regarded within that number of years. The second growth is very slow growing for a number of years but the rate of growth becomes accelerated as the soil regains its fertility with the passing of the years. The soil of Lifu is not as slow in

recovering as the soil of Uvea but for at least three or four years there is little growth than grass in an old garden area, though this grass is much more vigorous in growth and much denser and taller than the grass on Uvea, often reaching a dense thick growth three and occasionally four feet in height in three or at most four years. This depends, of course, on the nature of the crop that was grown in the soil, such things as sweet potatoes take an enormous amount out of the soil, and where it has been there is little or no grass at the end of three years and longer. At the end of four years the second growth of trees and shrubs begin to make their appearance but do not make a rapid growth till about the eighth year and from that time onwards the rate of growth begins to increase rapidly. There are of course places where the growth is earlier or later according to the fertility of the land, but the foregoing is true for the greater part of the land. At fifteen years the second growth has reached about ten feet in height and is not very dense, this stage is about the same as one finds in native gardens in the New Heb. at the end of the fifth year. Even at twenty or twenty five years it is very easy to see which areas have been garden areas as the trees are still almost solely soft woods and are seldom more than a few inches in diameter at the thickest part of the trunk. In the early stages these gardens are of little value as bird habitats except for such species of rails as may find this grass type of area suitable. Later they slowly become more suitable habitat and birds begin using them again to an increasing degree, till at about the fifteenth year the number of birds per acre is more or less normal though the greater part of such populations are com-

posed of Zosterops and species of like habits. When the scrub and bush is first cut to make the gardens and while the trash is littering the ground awaiting the time when it will be sufficiently dry to give a clean burn, insect life in and about the area increases enormously and the bird life also gravitates to the areas to feed on the increase.

LOW TI TREE SCRUBS.

These scrubs are only found on the volcanic strip in the south of the island. The only reason this type of scrub is in existence is because the rotation practised in the area is so short that no real sized scrubs of bush can grow. This has been the case for generations and the greater part of the larger types of vegetation has become completely eradicated and no longer occurs in the area. The cycle used for gardens in this area is not longer than five years and is often as short as three years. The soil is fertile and stands up to this fairly well though it was beginning to show signs of depletion in recent times; but the natives were wisely advised to use the Cadjan or Pigeon Pea to restore the fertility of the soil and they generally nowadays plant this legume at the same time as they plant up the garden with their other crops and the result has shown in an increased yield all round. The Cadjan is left and grows along with the quick growing type of ti tree and in five years or so they are generally nine to ten feet in height and fairly dense. They attract a great number of insects and birds, besides attracting certain of the pigeons, especially Chalcophaps, which may be seen in large numbers feeding on the fallen peas of the Cadjan. The strip of country where these conditions exist is everywhere narrow and has

nowhere sufficient width to form an area which could develop a bird life or zone of its own. Generally speaking the bird life in this area is denser per acre than elsewhere but the greater part of the bird life present is composed of only a few species which are present in great numbers. Gerygone probably reaches its densest population anywhere in the Loyalties in this small area and certainly its densest on Lifu Is. There is a similar area of ti tree on Mare Is. caused by the short rotation practised and intense culture but on that island they do not use the Pigeon Pea and the result is noticeable in the soil and the resultant crops, which though the soil is probably richer than on Lifu does not produce any better if as good crops. The beauty of this Cadjan is that the crop may be grown at the same time as other crops without any harm to them and supplies another form of food in the peas which are eaten in quantities by the natives and are a very good food.

COCONUTS

These are the only form of permanent cultivation on the island and are much the same as elsewhere, though on Lifu they have a tendency to have more scrub between them than elsewhere. The natives believe that leaving some scrub between the lines of palms keeps the soil more moist, as it does, and in many places they are now planting the Cadjan as a cover crop between the lines. This is a very wise move as it not only enriches the soil and fixes free nitrogen from the air but the habit of the plant is to grow well clear of the ground and allow no trash or grass to grow on the ground under it and consequently the ground remains more or less bare and it makes the collecting and finding of the nuts much easier and more thorough. This practice

is of considerable value to bird life as it not only makes the coconuts more attractive as a habitat to species which otherwise would seldom visit the area, but it enormously increases the available food for many species. The resultant value to coconut culture in the increased bird life of such areas and the control they must exercise on the insect pests is incalculable, quite apart from the agricultural value of the cover crop and the value of this extra source of food in time of drought, and the practice should be greatly increased. In some areas it is now customary to plant this cover crop with all new planting of coconuts and it is distinctly noticeable that the young palms in such areas never show the scale diseases which are noticeable elsewhere and this I believe is due entirely to Gerygone which under cover of the Cadjan may often be observed searching over the leaves of the young palms, a thing they are never seen to do where the young palms are in the open or in recent slashed low second scrub unless this second scrub is at least two to three feet or more above the top of the young palms, a condition which is detrimental to the young palms. In certain areas the acreage of country under Cadjan is almost extensive enough to begin forming a habitat and bird life of its own, but as most species of birds seem to be at home in this type of country it will in time become merely an extension of their other habitats and will replace such areas as are being alienated by cultivation. Unfortunately the whole area at present under coconuts, and such areas as in future will be eventually put under this type of cultivation, will not be completely put under Cadjan as soon as the natives have sufficient under the legume to supply them with a safe food margin in droughts they will probably stop planting this as a cover crop in coconuts apparent. To a limited extent

the shrub will plant itself but it could never become plentiful under those conditions. If the administration would enforce the planting of it at the time that coconuts are planted not only would the soil and crop yields be greatly improved but the bird life could greatly assist in keeping insect pests of the crop under control and the reserve of bird life created on the island would be an enormous asset.

LANTANA SCRUBS.

In old garden sites and along roads where the soil is a little higher fertility than usual on the island lantana grows, but in no place is it a vigorous growth and on the average soils, though it grows, it does not become the usual dense growth common to this pest and the bushes and patches of it are scattered and are easily penetrated. It nowhere assumes the dense impenetrable thickets it forms elsewhere nor does it become as dense as it does on Mare Is. It forms a habitat much favoured by certain species of fruit eaters and even insectivorous birds appear to favour it to a limited extent. It is widely scattered all over the island mixed with all other types of habitat except the forest and only in old garden areas does it approach sufficient commonness to be considered as a sub-type and as even in these areas it forms only a low percentage of the vegetation being much mixed up with other shrubs and bushes such as are common and natural to these areas it can well be ignored except to mention its presence and that it has some value as a food supply for certain species.

GENERAL SUMMARY OF BIRD LIFE AND NOTES ON SPECIAL SPECIES.

GENERAL SUMMARY OF THE BIRD LIFE OF LIFU ISLAND.

The position on Lifu as regards bird life is very satisfactory today in spite of the fact that some species previously

present on the island are now extinct or almost so. Lifu is undoubtedly the island with the most bird life per square mile in the Loyalty group and the position must be just about normal and, considering the low fertility of the island, one might almost say the bird population was slightly above normal, though if the whole island is taken into consideration and not only the areas which first come under one's notice it is seen that the birds seem to be just slightly below what would be a normal number taking the other islands of the western Pacific as the yardstick. The reason for the exceedingly healthy position on Lifu is that the natives have pursued a wise policy in their use of fire, and the introduction of certain plants and herbs have benefited the birds especially with comparatively recent times. Also the long cycle of rotation practised and the generally higher standard of the agriculture practiced by the natives has been conducive to allowing areas which have been alienated from the normal habitat for the birds to sooner become suitable, and with Cadjan for only a matter of a few months are they unsuitable, and once they have become again suitable they are allowed to remain as habitats for a longer period.

As regards natural or native foods on the island insect life has probably always been abundant and has been an ample source of food supplies for the species that live on them. The position as regards fruit-eating birds has not been so good though there has always been a considerable amount of food for certain fruit eating species other species have not been so well off. The recent importation of certain fruits and berries which have become or are becoming established has improved the

position for these species somewhat, in fact for almost all fruit eaters the position is today fairly good. As regards mollusc feeders and ground feeders in general with the exception of one rail and ground feeding pigeons the position does not seem at all good but the reason is hard to see for this. Taking the total numbers of birds per square mile figures are well up to standard and in a very sound and healthy condition but if individual species are considered this is far from so in the following species: Porzana cinerea tannensis, Porzana tabuensis, Porphyrio albus caldonicus, Ducula pacifica tarrali, Trichoglossus ornatus massena, Turdus poliocephalus pritzbueri, (if all the Lifu birds are the sub-species named above) and it will be later dealt with as to the possible reasons for this.

A study of the Lifu island birds and the species found in other islands of the group seems to point to Lifu having had some form of an influx of species from elsewhere that missed the other islands. It is more than likely that a number of species found on one or more of the other islands of the group originally came to Lifu at the same time as other species were introduced and spread from Lifu to the other islands. This is rather difficult to prove at this stage but in later notes some observations made along these lines will be made and the total results may be added to a comparison of the species found in surrounding areas from which the species originally came to Lifu and perhaps more definite conclusions may thus be arrived at.

As far as is possible to ascertain today there are only one definite species and 2 sub-species entirely confined to Lifu and one of these, a sub-species, may be open to doubt.

Previous sub-species which were thought to be confined to Lifu will with closer investigation, I believe, be found to be present elsewhere not necessarily in the Loyalties and as Lifu was done at an early date numbers of these at present recognised sub-species are only synonymous for the same birds elsewhere. The writer has not had the opportunity of examining a series of different islands at one time and has to depend on memory of the birds in the field for his comparisons but believes in the majority of cases it will be found that he is correct in his supposition that a number of the birds on different islands do not show sufficient or regular enough difference to warrant the creation of a sub-species as has already been done in several instances.

A consideration of the avifauna of the Loyalties as a whole seems definitely to point to a more or less recent arrival of all its bird life other than sea birds from surrounding areas and only the earlier arrivals of these will be seen to have developed definite characteristics of their own and though others may have some small constant difference it will be seen to be very slight and the similarity to the species in the area from which it came to the Loyalties may plainly be seen, especially if this as it were parent species in the other area is a more widely distributed race. This will be later looked at in a summary of the probable origins of the birds of the Loyalties in comparison with the birds of the two nearest areas from which these may have come, the Southern New Hebrides and New Caledonia, though such will have to be considered in conjunction with your own findings of a comparison of specimens from all three areas at one time as all my observations are

made from notes in the field at the time and from memory of the birds as seen in the field and their similarity in habits and so on.

A general brief summary of Lifu bird life is that the position is sound in all but a few species and in the majority of species it is more than sound giving a general impression of a bird life in excess of what one would expect to find on the island. Taking into consideration the usual lack of large fruit eaters of the Loyalties generally, Lifu is above normal in those. It is above normal in small fruit eaters and small insectivorous birds and below normal in ground frequenting birds except in one species. There are exceptions in all these classes of course. Honey eaters or blossom feeders are well up to normal in the smaller species but not so plentiful in the larger species. Parrots are visitors or accidental and periodical visitors that stay for a time but whose numbers fluctuate over long periods. Hawks and owls are plentiful. The balance of bird life on the island appears to be sound in all but the ground birds and as swamps and surface water are nonexistent in the area there are no fresh water birds.

GROUND FREQUENTING SPECIES AND THEIR SCARCITY ON LIFU.

The ground frequenting species such as rails, coots, and thrushes show an extraordinary position in their status in nearly all species of these present on Lifu and the probable best way to arrive at any conclusion about the position is to take species by species and give all known possible reasons for the present position.

1. Hypotaenidia. This species is exceedingly common and is found all over the island. It is about the only ground fre-

quenting bird which is common on Lifu. It feeds much on seeds and small molluscs but to the best of my knowledge it does not feed on large snails. It suffers somewhat from natives' domestic cats gone wild in the bush and is often caught by them in and about village. It is pugnacious and will attack and kill domestic poultry especially the young. It is a large breeder and breeds throughout the greater part of the year, generally raising at least two broods and often more in the year. It is possibly sufficiently pugnacious to be free of attacks from rats during its breeding season but rats may account for a number of the young each year. Snakes also may be a minor factor in their annual mortality, but I could find no definite proofs of such and natives seemed to think that as regards deaths in this species from this cause snakes never were responsible. Without a doubt the greatest enemy of this species and the one which accounted for the greatest number per year is the domestic cat gone wild or still domesticated. The cats must account for great numbers per annum as I have seen one domestic cat catch five in one week and natives have told me that they have known their cats catch as many as two and three a day for several days per week. Natives at one time used to catch them in snares but have given up the practice because cats invariably nowadays clean the snares out before they can get the captured bird themselves. Even with this heavy mortality this species has not only managed to exist but has remained exceedingly abundant all over the island so that none of the above attacks on this species can be considered of any serious account.

As regards this species on the island its habits and economy are identical with elsewhere and nothing need be said on that score.

2. Porzana (Poliolimnas) cinerea tannensis: This species was once exceedingly common on the island but in comparatively recent times, within the last ten years, has shown a rapid decrease. When I first arrived on Lifu natives said I would have no difficulty in collecting this species as on the east coast it was still plentiful. Investigation showed this was not the case and in each district I visited natives were all under the impression that though the bird had disappeared from their own district it was still plentiful in neighbouring districts. On close questioning it was found that in several districts the bird had not been seen for a number of years and in only one or two districts had one been seen in the last three years and in only one district had one been seen in the last year. During my stay the interest aroused by my work caused a more careful note to be taken and as I had a reward out for the finding of the bird and had made my offers through the island chiefs and thus knew that it was known in every village on the island, I expected some results. I had not one single report of the birds being seen by natives during my stay and only twice saw it myself for certain and both these sight records were very fleeting and made at the one place on the east coast. These sights were really too brief to be of positive value and the only thing that could be said for certain was that a rail a good deal smaller than Hypotaenidia was seen and it had a very conspicuous white eye-stripe. I have little doubt the rail which was once so common on Lifu was P. cinerea tannensis (though I have no ideal whether it has only been sight recorded before or actually collected, a thing which is actually the case in some other species recorded from the Loyalties) as the

natives gave very accurate descriptions, different natives from entirely different areas of the island giving a very similar description and remarking on the habits of the bird. If this species was a bird that depended on water its disappearance might point to there having been more water on the island and as the water has disappeared the race has dwindled. Such is not the case, as as long as natives can remember there has never been surface water on Lifu and there has been this bird, and though they say they noticed it beginning to decrease long ago it has only very recently become scarce, and it was only my enquiries made them realise that the bird had now almost entirely gone. Without giving the matter serious thought when asked what they thought had wiped the bird out they promptly blamed the big hurricane in the early thirties but on close questioning for the reason that they thought that was the reason they invariably immediately abandoned the idea and gave their reasons for it. The greatest number though it was due to the number of domestic cats gone wide, some blamed rats, some said they didn't know what it could be though for a number of years they had noticed the rapid decrease in nearly all the ground birds, and a small number, and they were I found the most reliable observers in other matters as they were wild pig hunters and real bushmen, all said that they believed that some mysterious sickness was wiping the bird out as some years ago though never recently they had often come across this rail dead or almost dead and with mucus about the nostrils, some observers even suggested that the bird looked as if it had been poisoned by something. The natives used at one time to snare great numbers of these but have long given up the practice

because the cats so often cleared out the snares and since the ware (i.e. 1918) there were so many failures to make captures that they had become discouraged. This would point to the decrease having commenced at some time ago and either been arrested for a while and suddenly increased lately or it has steadily been going on all the time till now a point has been reached where the bird is extinct or very nearly so.

A brief summary of all the possible causes of the bird's decrease would be as follows as far as is visible without the matter being thoroughly gone into over a long period and a proper examination made of all the food and enemies it may have on the island and a search for any possible diseases that the bird may have that has been responsible for its status today.

First would be possibly the greater number of domestic cats gone wild on the island and I have never seen an island with so many cats in the bush but strangely these appear to stay fairly close to the native villages and in the bush well away from the villages it is unusual to see cats. These cats doubtless remain near the villages to feed on the easily caught chickens of the natives, which they do. The natives in turn are very fond of roast pussy and a large number come to this end each year. When P. cin. tannensis was common on the island they were more plentiful in the forests well away from native dwellings; this would make it seem that the cats were not responsible. Also natives say that the bird began to disappear before the cats became numerous. Also the native and the introduced rat are very plentiful all over the island, especially the former and it is not an exceedingly active species and falls an easy prey to cats. Cats live a great deal on lizards also

and these are plentiful and easily caught. It would thus appear that though cats undoubtedly catch a number of rails when these started to become scarce they would turn to more easily caught food and so cannot be held responsible for the wiping out of this rail.

As on Mare it is noticeable all through the forest that the indigenous ground snail has at one time been very plentiful, and though it is today by no means uncommon it is evident that at some time it has been much more plentiful, and judging by the age of the shells to be seen a great many have died at about the same time. Closer examination shows great numbers of their shells with a hole in them, very small and not unlike the hole made by the small limpet like parasite one sees on sea shells (trocas and green-snail), and it is just possible that there has been some sickness amongst the molluscs which has wiped them out. This was possibly introduced on the garden snail introduced by the French for eating purposes. On Mare the snail definitely had some sort of sickness and as the eating snails were introduced to that island they may have carried some sickness harmless to themselves but which was fatal to the local snail; much as measles is of little account with Europeans and is very dangerous with native races. The garden snails introduced to Lifu came from Mare, whereas the ones taken to Uvea were taken direct to that island though they are not at home on that island and do very poorly. As regards Porzana this large species of snail probably plays little part in its diet and unless the smaller species of molluscs on which it feeds are also susceptible to this disease its presence on the island should have no effect on the rails. This might quite possibly be the case as it is more than likely the native molluscs of the island are sufficiently closely related to be susceptible to the same diseases.

If when a mollusc has this disease only slightly it has some toxic properties in the diseased tissues any bird eating it might in time become poisoned. Even so this seems rather far fetched and it would need some very careful work to prove or disprove. If it were merely a matter of the snails dying and thus reducing the available food supplies, it would seem more likely one would expect to find these molluscs rare on the island but such is not the case as the visible food supplies on the island could and should support many thousands of bird of all the mollusc eating species.

Another cause might be rats but the native rat has long been on the island and he is the only common species in the bush. About European houses and dwellings the ship's rat is present in copra stores and docks and about the coast or where pandanus is present it is fairly common, but well in the bush it is not at all common in spite of what a great many of the natives say. They today confuse the native rat with the ship's rat and consider all rats the same, though when closely questioned they admit the difference and the old men especially remark on it. There is little doubt the rat does cause a small mortality in almost all species of birds but they do not cause sufficient mortality in Porzana to account for the enormous decrease which has occurred in this species over the last twenty years.

Another possible cause is that the habitat has altered but if this is so it is not visible to the eye as natives and whites of long years' residence have observed no changes in the island. It is possible this species was brought to Lifu from some other area by a hurricane or some such agent of natural distribution and found the habitat uncongenial; but this hardly seems possible as for many years it found the area sufficiently congenial to increase its numbers up to such a state that it was considered common.

Thus apart from some sickness which may be present in the species it looks as if either cats, some toxin in their normal food, rats, or a combination of two or more of these mentioned reasons are responsible for the decrease.

3. Porzana tabuensis: This species was never very common on Lifu and being exceedingly shy and retiring would even in the old days have been seldom seen, but there is not the least doubt that this species was once much more common on the island than it is today. Old natives tell of snaring quite large numbers of them in the old days and of catching them in fires in grass patches but this has not been customary for nearly fifty years. When the natives used to snare the larger rails they very occasionally caught these small rails but though they often saw them they said it was purely accidental as these rails could pass through the loops without being caught and their other form of snares were of no use for catching them as they could not be set with a bait that would attract this species. Though the species was never common on the island compared with the other rails it was probably in correct proportion and distribution on the island. Today it is very rare and the population for the whole island is probably in the low hundred if as high as that, which is open to doubt as the natives knew its calls and these are seldom if ever heard today. During my stay I saw one for certain and another which I believe was this species. The one seen plainly happened to dash across a narrow roadway within three feet of where I was standing, too close for a shot, and to me it appeared identical to members of the species I have seen in other islands and I have no hesitation in saying this species is present on the island.

From what I could gather from natives it was only within the last ten years that the species had commenced to decrease and only within the year or two that it had completely disappeared. All the records of it having been seen within the last three years that I was able to collect were three and through the chiefs I only added one other sight record; a total of four for the whole island.

All the factors mentioned for the previous species as possible causes of the decrease might apply to this species and probably in an equal degree.

4. Porphyrio albus caledonicus: This species has never been very plentiful on the island but there used to be quite a number of them on the island which is not the case today. I doubt there are more than a hundred on the whole island. The natives when asked about the species always say they are present but that Lifu is "no good island belong him. Place belong him Caledonie, full up that one pidgeon long New Caledonia. He got small he stop long Lifu but he no plenty, before he got little bit, nowhere he no plent." From inquiries I made the species seems to have disappeared within the last ten years and during my stay I did not see a single one nor any signs of them, and only heard of one report of a single pair having once been seen during that time, three months. I spent several intensive days looking in the area where they were reported and found no signs of them but from what the natives said this pair bred in the area the previous season but the young had evidently perished or left the district. Natives on Lifu have never complained of any damage in their gardens from this species in recent times but some of the older men could remember when they used to do a lot of damage at certain seasons in the gardens. One old man told

me that always after hurricanes they were worse, and I found a folk-lore tale about the arrival of the bird on the island first which connected its arrival with a hurricane. The people had all their gardens destroyed by a hurricane but a clever medicine man on the island knowing they would starve made magic and hundreds of coots arrived on the island which were thin but enabled them to live till they had some food. By what I could gather these arrived some little time after the hurricane, probably having left elsewhere where their food was destroyed, and from what I could gather the hurricane must have occurred early in the 19th century as they actually spoke of it "in the time of my father's father's father's father's father," six generations or roughly 120 to 150 years but as they always refer in time to the time of the old men and not to a young man this would mean at least two and even possibly three generations thus mentioned were alive at the time. Even so it is probable numbers of the birds which arrived and escaped the natives went elsewhere to more congenial surroundings as Lifu never seems to have suited them very well. There is no doubt the species has decreased to an enormous extent on Lifu and though there are no definite signs of the reason all the possibilities mentioned for the rails are also possibilities in this species with the effects on the status from such causes as cats, rats and snakes much reduced and an added cause might be pigs in this species. This seems a rather far fetched cause to be responsible in this species to have decreased them to their present status as once the species became less common they would all nest near native gardens and the natives in protecting their gardens from the pigs with hunting and fences would afford protection to the bird also in such areas.

As regards habits from what I could gather from the natives the species seems identical with elsewhere in its range.

5. Turdus poliocephalus pritzbueri: This species at one time was one of the commonest species on the island and was not a shy species and was often seen in and about villages and was exceedingly common in the forest and along roads and almost anywhere on the island. Today I believe it is almost entirely extinct. During my stay on the island I had the whole island on the lookout for this bird. At the monthly meeting of the chiefs of all the villages on the island I got them when they returned to their villages to make it public by notices and announcements that if any native would come to me and record the single occurrence of having seen or heard the bird I would give him twenty francs and if I collected the bird or he did I would pay him 200 francs. I had not one single report of the presence of the bird on the whole island though I know a great number of men and lads spent days scouring the island for the bird.

The history of the decrease was as follows from what I could gather from reliable observers amongst the natives. (When first asked why they thought the bird had disappeared the majority of natives invariably blame the hurricane in the early thirties but on thinking over it for a minute or two they invariably correct themselves and say that that cannot be right as they can remember that well before the hurricane the species was becoming rare and then give other reasons such as are given hereunder. The remainder of the natives are from the start positive that the hurricane, though it may have destroyed numbers, was not responsible as they could give me actual times and number which showed the species was rare well before the hurricane and a few were seen after the hurricane. The major-

ity of these natives blamed the rats for their decrease. In the war years the species was still common and up till 1924 the numbers seemed more or less normal, from then on they began to decrease rapidly and this was noticed by all the natives and one or two spoke of finding sick birds but none mentioned anything about the birds except that they were afraid to eat them as they looked sick. A number of very intelligent natives went to France for some colonial exposition in the late twenties and this is what one of them told me. When crossing the island to catch the steamer to leave for France he noticed there were plenty of Turdus about and he thought that the birds had increased a little in numbers as he had not seen so many for a long time. He returned from France in the early part of 1931 and by then there were hardly any Turdus left and he only saw two from then till the time of the big hurricane. Another native who left at the same time but came back early in 1930 said much the same thing, and another who came back in 1929 said he saw quite a number about when he first returned but that they very suddenly seemed to decrease in numbers and he also mentioned having found apparently sick birds in and about the bush and gardens. This is a species that the natives are very likely to observe closely and fairly accurately for two reasons; they are very fond of the bird for eating and in the days when it was plentiful must have eaten a fair number each year; but even so probably the number eaten had little effect on the status of the species as they would only use sticks and stones to capture them with guns being rare and ammunition expensive and the meal obtained would not warrant the expense of the shot; the second reason was that at the time were breaking up the soil for their new garden sites the bird used to be very

common about the place feeding on the fresh turned soil where insects and worms were plentiful. The natives used to consider a sign of good luck if large numbers visited the garden site and that it was an augury of a plentiful crop from that place, probably a true sign as the more fertile the soil the more plentiful the insects and the more feed for Turdus.

Thus it is seen that during the 1920's was the time the species began to decrease and by the 30's they were almost gone or in a very bad condition as regards the status of the species. From all the data I could collect from natives the sight records of the species in the 30's before the hurricane (in '33-34) amounted to about twenty and allowing for unrecorded sight records, and these would be a big lot, there were probably about one thousand sights. In the year immediately following the hurricane I could only find twenty sight records by natives and some of these were a bit uncertain as they were not too reliable observers, but at least 15 could be relied on. Thus there were possibly 500 to 800 or a little more sight records. In the following year I could only find 5 records of sights and from what natives said there could not have been many more than that on the whole island. One reason for this may be that some of the records made after the hurricane were final records and those particular birds went down the natives' throats, this would mean that my estimated figures for the second year after the hurricane were somewhat too high. From that time on, that is '36 and '37 there was not a single sight record of Turdus made by any native. It is possible there are one or two left on the island today as it is a big island but I very much doubt it and the natives themselves are sure there are none at all. It

certainly seems as if the species is extinct and it is at least certainly in such a position that it is almost sure to be extinct and is beyond the recovery line.

The reasons for the extinction of the species are not easy to see as regards natural causes on the island unless it is because of some far fetched cause such as a disease or some form of food poisoning. The natives or rather a great number of them say that the rats are responsible for the decrease in the species. They say that Turdus roosts at night in the tops of pandanus palms and these being favourite haunts of rats, the rats have killed off the species. They blame the introduction of the large ship's rat to the island, and though this rat is present my own observations lead me to believe the rat is as yet not very plentiful on the island and is still only found close to the copra stores and the villages on the coast. I do not believe that they are at all plentiful in the forest or the bush and natives told me the same thing, and they said the native rat was the only one in the forest. When they were asked how they reconciled that with their theory that rats were responsible for the decrease in Turdus, they gave all sorts of answers that were of such a far fetched nature that they were too impossible to believe. The two best ones were that the ship's rats like the natives knew that Turdus was a very sweet morsel to eat and made a dead set at them till they were finished. The other was that the native rat had suddenly taken to eating Turdus probably because the introduced rat had told it that they were good eating. The others were so far fetched that even the natives themselves did not believe the tales. There is no doubt rats do get some birds each year especially the young or eggs, but they could not account for the decrease

that has taken place in this species.

All the possible causes of decrease that have been enumerated for the rails would also apply to Turdus with cats as a possible factor to a much greater degree as the species was said to be not at all shy and to be very common about villages and their adjacent scrubs where the cats are most plentiful. This would not account for the decrease in the forests as the cats are by no means plentiful there. Human persecution may be a factor of considerable importance in the status of this species as they suffer from native persecution and I believe the French residents on the island were very fond of them also as they are said to be on New Caledonia also where they have almost wiped them out by all accounts. Even so human persecution cannot account for the decrease that has taken place and the reason is not as easy to see as all that. In observer's opinion there must be some as yet unknown or unproven cause which is really responsible. I have no doubt that after the hurricane in the early thirties a large number fell to the natives as they would be short of food and any bird would be looked on as food. There were definitely numbers of them seen after the hurricane and as this species has its food supplies increased by hurricanes it seems hard to understand why they did disappear so rapidly and more or less all at once. It is just possible that the disease which had already reduced them so greatly received a fresh impetus just after the hurricane extra food supplies were becoming exhausted and the birds were returning to more or less normal conditions and that, in conjunction with the attacks from natives, was too much for the bird and it simply succumbed and died right out. Another possible but rather far fetched theory

is that actually the bird comes from outside and the habitat on Lifu is unsuitable and after breeding up to a certain degree it simply begins dying off because of some lack in the habitat which rapidly becomes more pronounced, possibly caused by a more than usually severe drought and the island becomes and remains an unsuitable habitat till the place has had time to build up a reserve again. In the observer's opinion the most likely cause is in some introduced disease in the snails of the island which is in some way detrimental to the birds which feed on them, not necessarily because the amount of snail life becomes too small to support the population, as it has never become so scarce as that, but because of some toxic or other cause actually to be found in the snails at a certain stage. The other factors such as cats have all contributed to the wiping out of the species and doubtless the hurricanes do kill out quite a number but all these things except the cats, ship's rats and any possible disease or food poison from disease are of only recent origin and so these latter must be held to be more responsible than the hurricanes, snakes and native rats or any other long standing natural causes of decrease in numbers.

It is worth mention that the two species Trichoglossus and Ducula also show an increase and decrease over the years but these do so for other and more easily seen reasons. In the case of the former it is merely that they arrive in large numbers from elsewhere and some return there and some stay on Lifu but do not seem to find it a very congenial habitat and though they do breed the race slowly disappears, till such time as another influx from elsewhere takes place. With Ducula as soon

as they begin to get at all common and consequently easy to shoot the natives and whites simply reduce their numbers wholesale till they once again become rare. Another factor is that this species is definitely in an unsuitable habitat on Lifu and the droughts and hurricanes reduce the available food for the species to such an extent that the island cannot carry the population and numbers perish. It is as it were that they are always living on the bare bread line and the least upset to the food supplies is immediately reflected in the number of birds on the island.

Thus a brief summary of all the factors which are visible on the island as being in any way responsible for the decrease in the above mentioned species would seem to point firstly that all the species affected are more or less ground feeders and though all can and do fly and could escape ground enemies they probably suffer from them to a certain extent. They are all snail feeders and if they were to suffer from some cause connected with snail food they would all suffer to a great extent and more so from the results of attacks from ground enemies as irrespective of size all would suffer to a like degree. Rats and snakes could not possibly account for the tremendous decrease which has taken place as the moment the birds became fewer in numbers their enemies would turn to more easily captured food; also for rats to be plentiful enough to wipe these birds and more especially Turdus out they themselves would have suffered from the snakes and cats. To the observer it appears as if there is definitely some as yet unknown disease, either in the birds themselves or more probably in the snails they consume and live on to a greater or less degree, snails which live on or near the ground being the most likely culprits.

This remains to be proven, though, as observer had no way of proving whether such was the case. Some such food poison or a disease are in observer's opinion the only things which could account for the enormous decrease which has taken place in these species.

It is perhaps worthwhile drawing attention to the fact that another species on the island which lives on the higher living tree snail to a limited extent was during my stay as far as I could see in an almost impossible position as regards the sex ratio and if the position was as it appeared during my stay on the island, this species will also suddenly disappear. That was Pachycephala.

THE PRESENCE OF CERTAIN SPECIES WHICH APPEAR TO HAVE BEEN
NATURALLY INTRODUCED TO LIFU FROM ELSEWHERE.

A glance over a list of the species of birds present on Lifu and absent on one or more of the other islands of the Loyalty group seems to point to at some time a narrow strip hurricane having carried a number of species to Lifu and from there they have spread to other islands. Some have not spread at all, others have gone in one or the other direction to Uvea or to Mare, and some may have spread from Lifu to the whole group and even to New Cal.

This hurricane could have come from anywhere in the north but taking the most likely area from which birds would come and be carried a reasonable distance and taking the usual rotatory movement of these kinds of storms and the consequent course along which birds would be carried it would appear as if the southern New Heb. was the most likely place from which birds would be carried. If one considers an average cyclone and the area it covers, (but as these vary so much in individual storms one cannot say that any storm would cover any given area so an

average is just a very rough and scientifically inaccurate guide) it is seen that a cyclone travelling SW as they usually do and recurving somewhere in latitudes south of the southern N.H. if it were to pass over Erromanga would probably pass over or close to Lifu and in any case the curve of the wind in this part of the world being anticlockwise would lay the birds along a northerly curving line swinging southwards over Lifu or in that direction, and thus probably carrying birds clear of Mare, depending on the position of the centre and the area covered by the disturbance. As we may presume the hurricane, to pick up and carry the birds, was of a pretty severe type, it was probably one which was very concentrated and did not cover an area of more than a hundred miles or a little more. My own observations of birds during hurricanes is that the birds do not fly down wind (if they can fly at all) but down wind and across or if the wind is not too strong they fly directly across it. Thus it is seen that in a strong wind providing the birds can fly at all and are not just blown head over head and carried along helplessly by it, a thing that does happen, but the birds never survive it for more than a few minutes, they will eventually get to the outside of the disturbance if the wind is not too strong or to the inside if it is strong or weak. I have observed birds in the very centre of a hurricane in the calm area and these were very exhausted and when first seen were high up but quickly dropped to rest; whether these were from another island or from elsewhere on the same island as I was on, I cannot say. I also noted that a number of birds were caught unawares by the hurricane when it suddenly swept in from the other

direction as the eye of the hurricane passed over the island which I was on at the time. Thus it would appear as if the centres of hurricanes can and do transport birds providing conditions are suitable and that the greater number so carried are picked up near the centre of the cyclone or even actually caught unawares by the blow as it returns in the other direction. If this happened on the lee side of the island the birds would be unable to return to the land and would be quickly carried into the calm centre and carried by that till such time as land was reached again or would drop exhausted into the sea. If a chart of a cyclone is made on tracing paper and the approximate lines of the wind shown lightly on it and the cyclone is given a disturbance area of 100 to 150 miles and laid on the chart it will be seen that Erromanga and Lifu would come under the one line of wind circling and making allowances for average rates of travel of the centre and the force of the wind it will be seen that the time of flight of a bird to cover the distance is not excessive nor beyond the powers of most birds with moderate powers of flight.

Thus it would be of interest to make close comparisons with all birds found on the two islands. Observer believes that birds found on Lifu may even have come from further north. It will possibly be found that many of the Lifu species are somewhat smaller than their relatives from elsewhere because of the less fertile area and less suitable habitat of that island has caused a reduction in their size.

The species Ducula lives on fruits on Lifu which it never eats in other parts of its range and the usual kinds of food which it eats are entirely absent on Lifu. The species more or

less barely manages to exist on the island and it is a well known thing to the natives and the whites that this species is worthless for food during six months of the year because it is so thin. It gets very fat at the breeding season and a little after which is a bad thing for the status of the species and one of the reasons why it has never become very plentiful. The other and main reason is that during the greater part of the year the island simply cannot carry the number of birds and a great number die off through starvation.

It will be of interest to see whether the thrushes of Lifu and Erromanga are anything alike. Other species of interest are Myzomela, Coracina, Lalage, Myiagra, Lichmera, Erythrura. Some of these species even though the same probably don't mean a thing, but I believe it will be found that many of the Loyalties species more nearly approximate (or are the same as) the more northerly species found in the New Heb. than they do to the closer geographically placed races found in New Cal.

It is of interest to note that Rhipidura fuliginosa bulgeri is recorded from Lifu; it is at present unknown on the island but it is not impossible that it, or more recently in the observer's opinion that the New Heb. race, has appeared accidentally on the island but has never become established for some reason. It is of interest to record that from natives and whites of long residence in the island I had the following reports of the occurrence of strange birds on the island and in one instance saw the feathers of the bird and was able to place the following birds as definitely occurring accidentally on the island though as to which race they actually were I cannot tell. Clytorhynchus, Neolalage, Halcyon farquhari, or possibly though the size given was too small H.c.tannensis, Macropygia rufa rufa

more than once and feathers seen and the skull, these I am as certain as one can be from descriptions have occurred accidentally. The following are rather indefinite as the variations are so slight and birds may have come from any area. Guadalcanaria notabilis, the natives know the New Cal. bird and say this one is quite different and pretty well described the Malekula bird, Zosterops lateralis macmillani, z.l. efatensis and two Z.flavifrons which from description seemed to be flavifrons and macgillivrayi. I also heard of one case of a bird which was probably Petroica m. cognata or one of the very closely related races, from the natives' description this was a male adult as two that saw it remarked on the prominent forehead patch and both seemed sure it was more of a brown than black on the back. This specimen was seen by a number of natives for a few days and then disappeared.

From the foregoing it is seen that for some reason Lifu seems to be in the track of birds accidentally carried from the north southward and though I was unable to definitely establish the fact that such accidental occurrences coincided with hurricanes the evidence distinctly tend that way and the only case I could definitely date to the year was the occurrence of Petroica which occurred at the time that a hurricane passed over the New Heb. and its centre passed to the westward a little north of Lifu. This cyclone was not very severe and it was not till I returned to Noumea that I was able from the weather records there to establish the fact of its presence and course. Strong but not very severe winds were experienced on Lifu at the time but no damage was done on that island. The occurrence of Macropygia and a number of others about the same time was a

year out from any hurricane which might possibly have carried the birds to the Loyalties, that is if the year the natives gave was correct which as it was 1918 may have been incorrect, such a length of time being rather long for the native memory to be accurate.

Strangely I found few definite records of such occurrences elsewhere in the Loyalties, nothing of real significance on Mare but on Uvea one significant instance was recorded in the arrival of Ptilinopus greyi.

In connection with this it is worth recording that in New Cal. after hurricanes Ptilinopus greyi occurs in large numbers and local residents say it is absent at all other times. They say it is carried down from the Loyalties. Also in New Cal. Ducula is unknown to residents generally, though a few know the bird and say that it only appears after hurricanes and is carried from elsewhere to Caledonia. They are sure it does not breed anywhere in N.C. and say it disappears very soon after the hurricane. This is open to doubt as New Caledonians are extraordinarily poor observers in the main. Also it appears strange though it may only be coincidence that the name of a district on Caledonia is exactly the same as the name the natives on Lifu use for Ducula, though Lifu natives seem positive Ducula does not appear on New Caledonia. The natives on Lifu are not positive but some of the very old men on the island say they have a hazy idea that they remember hearing in their young days that Ducula was a bird that had not always been on the island. By what natives say it does not seem impossible that within the last century Ducula was for a number of years

extinct on Lifu and then a fresh influx re-established the species. It seems very probable that there are additions to the numbers of Ducula present on Lifu from time to time from what both natives and local white residents say. Whites and natives remarked on the enormous increase in its numbers just after the big hurricane in the early thirties, and all say that very shortly after it the numbers decreased a great deal as if birds had gone elsewhere. In other years, when Lifu has not had hurricane pass over it, but pass it close by, generally to the north but occasionally the centre has passed of Mare and there has some years been a noticeable increase of Ducula on Lifu. From that it appears possible that the place on Caledonia which now has the name the same as that used for the bird on Lifu once had this species present on the area but it has since disappeared.

Another natural phenomema which might be a factor in bird distribution is waterspouts or small whirlwinds. I have seen one of these pick up birds and carry them aloft out of sight. If the birds reached a great altitude unharmed and still able to fly they might set out in any direction and slowly losing altitude arrive at land at a great distance from where they were carried aloft, and on quite another island. It is a point worthy of note that the small whirlwinds generally occur in hot but still hazy weather or hot still good visibility weather, both of which factors could play a large part in the probable place the birds might land. Also generally speaking a bird carried aloft would get free of the air currents at a spot very many miles to one side or the other of the spot where it was picked up. On the west coast of Santo I saw one of these phenomena where the cloud from which it had decended was fully six miles to the west of the

spot where it reached the earth and off Meawo island I saw one in which the cloud was fully 12 to 14 miles ahead of its tail point. These distances I could gauge by known distances on the earth's surface and I have seen others with wide variations like that which I could not accurately gauge.

A single occurrence of a pair of Australian birds was recorded by me on Lifu and as both birds were in captivity for two days before they died the record is sufficiently reliable to record. These were almost certainly descriptions a pair of Aplonis metallica, both males. From other native accounts there have been other occurrences of this species on the island long ago. This pair arrived at a village on the north coast of the island shortly before sunset on the 4th. Feb. 1932. They were seen to arrive across the sea and flew straight into the village and landed on the grass plot or square of the village. They appeared very exhausted and barely cleared the lip of the 100 ft. cliffs on the coast at that point. Native youths walked straight up to them and captured them by hand. They were taken by natives to a white trader at Chepenehe the same morning and he caged the birds but they died very shortly after. It was from his description I placed the birds as the Aust. race of Aplonis.

There were a number of records of Egrets or some large long legged waders being shot on the island but I could not establish their identify closely enough to be sure what they probably were and there was always the chance of them being the white phase of Demigretta, though whites and natives all said these were very much larger than any Demigretta they had ever seen. Some feathers I examined of a long legged bird shot some few years ago on the island appeared to me more like the feathers

of some species of Threskiornis than anything else, but native descriptions did not tally with any of this race known to me. When I showed a plate of the Australian bird to the natives they said the bird was like that in shape but the coloring was different, and from the size I should think this bird was either a smaller species or an immature. The feathers I saw were I think from the wing and had a mottling of white on them.

There were a number of other records of accidental strange birds which either from lack of a decent description or from the indefiniteness of the data available I could not place at all. Some of the records of a strange bird seen by only one man I did not even record on paper as they had no means of proving or checking up on from other witnesses.

Pachycephala pectoralis littayei: The position of this bird during my stay on the island was in such an extraordinary position as regards the sex ratio that I have to make some record of it. If the position was as it appeared the race is doomed to eventual extinction on the island and that within a very short time. During my stay on the island I must have seen at least 1000 male adult and probably as many as 2000, as I made very intensive efforts to collect the females and, counting the birds natives I paid to help in search must have seen, the number was well over two thousand, yet I only saw one single female or specimen in female plumage and inquiries from natives in villages brought no other records of birds in female plumage being seen. Males were extraordinarily numerous but female phases seemed to be almost entirely absent. At that season the birds were breeding as the only female seen or collected was in full breeding. Granted

that the brooding females were there they would have to leave the nest to feed sometime and even if in this species the male feeds the female as I believe they do quite a lot, it seems extraordinary that almost every female on the island should be brooding at one and the same time. Also this does not take into account the immatures which have the female plumage, or I presume they do as such is the case on Uvea and I believe the races to be the same. Natives told me that female plumaged birds never were common on the island but there were always a few about and that the numbers of birds in female plumage seemed to fluctuate a little at different times of the year. This would be in accordance with the numbers of immatures no doubt. Questioning of old men seemed to show that birds in female plumage were once more common than of recent years but they have never anywhere approached males in numbers. All natives did not think that there was any difference in the shyness of the species and any difference there was was the male was the shyer species and could not be lured as easily as the female to approach the observer. This was in accord with my observations of the species on Uvea. It is worth mention that the only bird in female plumage I saw and collected on the island was nowhere visible when I first began looking for the bird which was calling. I found two males in adult plumage doing the calling and on the odd chance that there might be others about I began to mimic their calls and try and draw them closer to me. They came a little closer but seemed to be rather wary, after half a minute or so of calls a female arrived, from somewhere close at hand, and evidently had just left its nest. This

bird was shot and a skin made of it and though I did not have a great number of days to try out similar attempts I had sufficeint opportunities to do similar things elsewhere so that even had females been in anything like reasonable numbers they must of have appeared. Besides which before collecting this specimen I had hundreds of times done exactly the same thing so that had females been present they would surely have appeared to the exactly identical calls. It is a fact that on Lifu male Pachycephala can be called from great distances to quite close to the observer and more than one at a time can be thus called. They come fairly close but once near the caller they appear to become somewhat timid and peer at one around the trunk of a tree or a branch. They behave the same way on Uvea though they cannot be called from such a distance on that island. Females on that island and the single female seen on Lifu behaved quite differently, they would come flying rapidly through the forest from quite considerable distances and at a great speed and apparently very excited and would alight very close to the caller, generally too close for shooting, but on seeing him they would move further away and would not go very far away as long as calling was continued. I have had them alight on my clothes and look upwards toward the source of the squeaking calls being given by me. They invariably appear to be excited and disturbed by the calls and are pugnacious and looking for something to scrap with. Even had the sex ratio been one in 100 I should have seen at least a few others in female plumage and as one left a nest to my calls others should have done so also, and I must have been in the presence of nests many

times if nests were there as I covered a greater part of the island during my stay.

Many natives when they knew of my desires to have a series of females set off promising to find one but all returned having failed and all seemed amazed at the absence of females. I offered a reward for the reports of the presence of any females and though a great number of men and youths and women tried to locate some there was not the single one seen by anyone but myself. When I was skinning the specimen, I had the usual audience and of eight people all under the age of thirty not one had seen the bird before though all had seen the male often. The following day with nine people all under the age of thirty, three had seen the bird. A day later when rearranging the plumage after wrapping for the 1st rearrangement, four out of five did not know it. Almost every native over thirty knew the bird well and though every one said they had not seen more than an odd one and very few in total for a number of years. From these older men and women I found that the bird had commonly bred all over the island and did not breed in one one area. They said it was equally plentiful all over the island where forests or low scrubs were found and from what they said I could find no area that seemed to offer enhanced prospects of collecting females.

The position seems extraordinary because the average for the distribution of males over the greater part of the island would be one to every 4 or five hundred yards in any direction and might possibly be a great deal higher and most probably is. But even at that figure the absence of females is amazing. It is worth recording that a number of natives said they had noticed a decrease in the species in recent years and a very marked one recently, but this opinion was

by no means held by all the natives, some saying that numbers fluctuated from season to season others that numbers remained more or less the same.

It would almost seem as if for some strange reason the species biologically had developed into a freak and only male cells were being produced or that female cells were being produced in less and less numbers. Even so that would not account for the absence of imm. during my stay on the island.

It is possibly a significant point that this species to a less degree than the other species which have so rapidly decreased on the island is also a mollusc eater. If the other species at one time were in the same position as Pachycephala is today it is quite understandable that they have decreased and it would seem to point to the molluscs in some way being the cause, though why only females should be affected seems quite inexplicable to me. I could not collect and evidence that the species that have decreased already were at any time in the same condition as Pachy is today but only in Turdus would this be noticeable as the other species show too little difference in the sexes to identify them in the field with any degree of certainty. Another possible point of significance is the fact that these are all ground feeders and feed on the molluscs found on the ground and presuming that the habits of Pachy are the same on Uvea and Lifu a reference to my observations made on the species on Uvea shows that the females on that island feed at lower levels than the males and often feed on the ground or amongs the vegetation very close to the ground. Even so it seems too far a stretch to make this account for the apparent extraordinary sex ratio at present on

Lifu even allow that I was exceptionally unlucky in my attempts to collect a female series. I will keep in touch with a reliable native on the island who will advise me from time to time as to the position and whether the males begin to decrease or the females suddenly appear from somewhere. The unaccounted surplus and strange movements of the species on Uvea can hardly be accounted for by birds crossing from Lifu as natives would have seen them at some time, also these movements occur at too frequent intervals on Uvea for birds to be crossing to cause them all the time and still remain unobserved by the natives. These movements might indicate some movement which was not taking place during my stay on the island but that I doubt very much.

The following are a series of day to day notes made while I was searching for the females of the species and help to show the extraordinary position from day to day. The locality names are given to show where the day was spent searching for the birds if such is known, and the suitability of the habitat as regards Pachy is given. Many days left out of this list and on all these it is probable an average of 5 male Pachy were seen and after the first realization of the absence of females the average of males seen was probably over ten as I never passed close to where Pachy was calling without investigating and seeing whether there were any females about.

28/6/38. Chepenehe. Fairly good habitat, low scrubs. A few heard.

2nd. 2 miles due north Chepenehe. Tall to med. forest & low scrub, good hab. Many P. calling appears same as Uvea

4th. West of Chepenehe 3 to 4 mls. Low scrubs, coconuts with scrub, gardens. Fair hab. Many heard, a number seen all males, one m/.ad.1/2 white. shot and examined sht. 8
30 am. wght. 42. 8 gm. W. 105 Tl 76. Stm. 1/1, molluscs, insects. Moult. Nil. Skl. C/O. Abr. w/ t. N.

- 5th. Pachy. very common, but have not seen a single female, believe they are nesting at present. Perfect habitat. All types.
- 7th. All types. A note in regard to Z.inornata says "Pachy has many calls and mimics to a certain extent." Elsewhere in small field book is the note under this date. No female P. seen but many males. It almost appears as if females breed deeper in forest or in other areas, natives say no.
- 12th. Went to tall forest well inland after Z. inor. Many male P. ad. seen not one female seen, they evidently do not breed in tall forest. This was in tall forests east of Thocking.
- 19th. Pachy. inhabits forests and low scrubs indiscriminately. Calls much and is much and easily heard at long distances. Is shy and hard to shoot. Will answer calls at a distance but stops calling at approach of shooter and will not answer calls once shooter's presence is known. This was in an area close to a large native boys' school and birds there doubtless suffer some persecution from the youngsters. 2 specimens taken No. 334, a & b. Notes elsewhere. P. will approach to within about 60 ft. but then becomes shy and even at that distance it remains invisible or peers at one round a tree. Elsewhere I have called them to me over considerable distances but it was noticeable this morning that they would not come near, possible the kids' school has something to do with that.
- 20th. All types hab. Several male Pachy seen, not one single female. 4 specimen males taken Nos. 335 a, b, c, d.

- 21st. All types hab. 1 spec. male No. 337. Notes elsw. Many male seen (P) no females. Most extraordinary. Where are the imm.?
- 22nd. Notes elsw. Note female Accipiters are rare, none seen to date, they are possibly brooding at this time but seem to stick pretty close to their nests. Seems to be a habit on Lifu as P. seems to be doing the same, sticking closer than a brother is not in it with these guys. Must look closer into this P. business and see if the females are in the centre of the isl. Being a mountain species in some islands they may have a habit of nesting in the interior, but they won't find any mts. in this dump, and they certainly do not seem to worry about the places they nest on Uvea.
- 23rd. Tall forest mostly. Went to middle of island (about the curved portion of the main road between Nung and Wei, south of Nung but possibly nearer Wei) in search of female P. and did not find a single one, tho males were very abundant. Can't get the strength of this species at all, what's it all mean.
- 25th. Noted many many male P. in forests but saw not one female. Am beginning to wonder if the females on this island have a male plumage, tho' this hardly seems possible and I have never heard of such elsewhere. NB. Look up A.M.N. Mayr on P. which Beck and others had to have their names given as the persons who sexed specimens, believe it was somewhere in the Solomons. If the f. here have m. plumage the Uvea birds must be new sub.sp. but they seem too closely allied and similar to be anything but the same. The

males here are indetical in habits and behaviour and are no shy, in fact I can call males to me from greater distances here. Perhaps that is an indication of the scarcity of f., if it is and the position is as it appears the race looks doomed. As the natives would say "What a life, better dead."

- 26th. One male shot 10 am. Wght. 43 gm. Tail shot away. Elswh. nts. P. seems in an extraordinary position I simply can't credit that I could have gone so long without seeing a female in the at least several hundreds of males I have seen to date. How can the species be so common if it isn't breeding? Natives say there is a female plumage but they are never common and they think they are another bird as they are generally alone (? imms.). They say one generally sees two birds with the black collar in close proximity, and come to think of it I have noticed the same to a limited extent.

- 28th. One specimen No. 354h. Male ad. The Pachy position grows more puzzling as there must be imm. somewhere as well as the females. Surely this race must be a freak and females have the male plumage but even so that would mean the imm. also assume the ad. plumage from the nest. This can't be so because the natives do kow of the fem. phase. Is there some biological freak which is wiping the race out as others have evidently been sadly depleted on this island.
- 29th. The absence of female P. in this area is most extraordinary. A count kept today in an area simply ringing

with P. calls showed 32 male plum. and not a single female. Natives who have been certain of finding some place where I can shoot some f. say they have never seen the like before. Tho' f. they say are usually shyer and not so often seen there are usually a few seen about. They say the female is the same as the Uvea bird, at least their description tallies. They say the female here feeds close to the ground often. Has this anything to do with it, as it is the ground birds that seem to be the species that have suffered here. Is it cats? I have never seen an island with so many cats in the bush (have shot 5 since I arrived) but these seem to be mostly in the bush close to the villages only and to feed mostly on the coon's chickens. Natives bear this out saying that there are few cats in the forest far from the villages. They once again blame the rats, they certainly have a derry on rats on this island. Ship's rats they admist are not found in the central forests, only the native rat being there.

30th. Close about camp, low scrubs and gardens, much Cadjan.

Noted close about campe 8 male plum. P.

August, 1938.

3rd to 6th. During past days and today much time spent looking for f. P. and have had a native shooter on the look all the time I have not been out myself and have had a large number of native youths and women on the lookout for it. On the 3rd the chiefs held their monthly meeting and I asked them to make my announcements in their villages and

offered rewards for Turdus, Porphyrio, 2 Porzanas, Tyto, Pachycephala and Ducula or reports of their presence.

I also discussed the presence of 2 Rhipiduras with the chiefs but none of them knew of the presence of 2 kinds.

They are to enquire of the village folks and let me know, they will at the same time send anyone to me who has seen any unusual birds on the islands at any time or recently. Chiefs all hold out little hop of coll.

Turdus, Porphyrio or the Porzanas and have advised the withdrawl of Tyto from my list as they feel sure I will be able to collect it on the east coast where it is far more plentiful or in the savanahs of the interior of the island. On questioning they say they have noticed the absence of Tyto at certain seasons but say the full moon is the time to get them and they believe the moon brings them out at all times of the year. It does I know but at certain times of the year they do not appear much at all. M. is probably right and at non-breeding seasons they are very shy and retiring. Note old time custom on this island with Tyto etc...

From this date onwards I spent a great deal of time searching for the Turdus and as they and P. like the same habitat I saw many hundreds of P. but all were male ad. plumage. The entries were monotonous in the regularity of numbers seen, generally between 40 and 50 a day when in forests and between 30 and 40 in lower types of forest or low scrubs. I tried at all times of the day in case I was looking too early in the morning for the birds to have left their nests. I covered much of the island as I used to go by the missionaries' car to the village

he was visiting that day and get him to drop me somewhere along the road where the natives thought I might get the birds I was after and the car picked me up as it returned or I walked home. When I finally moved to the east coast on the 17th Aug. I noted that birds seemed slightly more plentiful there but the result as regards Pachy was just the same. Though I knew it could not be so I shot as many as 20 P. in the one day and examined them on the spot of shooting in case the females had a male plumage, and I more than once shot birds which by their behaviour when in a party might have been female but all proved males. It was noticeable that they were all pugnacious towards one another in a greater or less degree. All males examined were in full breeding or very close to it. I kept a close watch on the gonads to see if they showed any signs of recent use as such would have been an indication of where to look for a female, but in not one single case could I find any sure indication of recent use. All testes seemed firm and white.

On the 23rd the single female seen during my stay on Lifu was collected in a habitat identical with square miles of similar habitats which I had searched fruitlessly through in places all over the island. This was a female in full breeding Sking No. 409.

In observer's opinion there must be females but they are very very few and the sex ratio must be one of the most extraordinary in the world.

(N.B. Dr. Mayr I shall advise you from time to time if I hear from Lifu anything about females being more common).

ZOSTEROPS

There are three species of Zosterops on Lifu and each has its own zone as it were which will be dealt with in the habits of each under their own headings.

The three species of Z. are seldom found together though they are often found 2 together. Z. inornate often being found in the company of minuta and rarely in the company of lateralis. Lateralis is often found feeding in the same areas as the other two at different times and places but can barely be said to be found in the company of them, though very rarely a single lateralis may be seen with a small part of minuta. Minuta it is more correct to say is never found in the company of the other two, tho' they may be found in its company. When inornata is found in its company there is never more than one of the larger species. It would probably be more correct to say all species may be found feeding in the same area and occasionally a single one of either of the two larger species may be found accompanying a party of minuta, probably only till such time as they may meet up with another of their own species. The only type of habitat in which all three species may be found feeding together is in native garden lands or in low scrubs immediately surrounding and close to that type of habitat. Inornata and minuta favour more scrubby types of habitat and lateralis favours more open habitats.

Zosterops minuta:

This species probably the commonest on the island is seen in almost all types of habitat, though it seldom visits the more open types, often visits the medium open types and favours native gardens and low scrubs and often visits forests. In the latter it feeds at all levels but seems to prefer heights

of up to 20 ft. from the ground or even up to the second leaf canopy of the Lifu forests and it is mostly only near banyan trees in fruit that it goes higher. It is seen in parties of from four up to 20 and more, but the commonest number in flocks is about a dozen. These are probably family parties of the previous year as the species raises more than one brood each season. The bird seems to breed throughout the greater part of the year, each pair probably breeding from six to nine months of the year and different pairs at different season so that there are always some birds breeding. The month when there are the fewest number of birds breeding are probably from late Feb. to early May, but a number commence breeding in May and the numbers rapidly increase from then till Aug.-Sept.-Nov.-Dec.- when all birds are in full breeding. The species makes the usual Zosterops nest but it is somewhat smaller than usual. Eggs are from 2 to 4 and occasionally 6, but the cases of the latter may be where more than one female lays in the nest. Strangely this species does not always drive the young away when the bird begins brooding the second time. The previous batch of youngsters continue feeding round about with the adult male and even go to considerable distances with him to feed while the female broods the eggs. I believe the male does some incubating of the eggs while the female goes off to feed and at such times the previous brood do not go with the female but remain close to the male on the nest and seem to be distressed by his actions of thus remaining on the nest. When the female returns she will often drive a youngster who has come to close to the nest away then returning will relieve the male. Incubation lasts about 7 to 8 days. Natives say that the first brood of eggs

is always four or more eggs, the second seldom 4 and if there is a drought it is never more than two and if the rains come early the third brood will be 4 again. Some natives claim to foretell the weather with the nesting habits of this bird and plant their gardens accordingly, but I could obtain no evidence of this actually being the case as from what I could see natives paid no attention to it at the time but I have no doubt that in the event of a drought a native who had planted a large garden would claim cudos and say the bird had told him to plant a large one.

This species is more insectivorous than most of the green backed Zosterops and spends much of its time like Gerygone searching the bark of limbs and twigs of the trees and scrubs for insects, ants being a favourite food. It finds the Cadjan and the low dense scrub (Pretrostrum) which has been introduced long ago.

The white side lines in the plumage of this species is very distinct in the field and is a combat plumage. When angry the bird can fluff this out amazingly and it gives the bird a fiercer and a most peculiar look. Like the crest of other birds this side plumage, which is very light and comes outside the wings and has almost a minute bird of paradise effect, is the means of showing their anger. They invariably have it out when they are excitedly gathering and calling about a kingfisher or owl or a snake, and, as they dart toward the enemy, never getting too close, and tremble their wings very quickly and slightly the front appearance of the bird is certainly much enlarged and the bird looks much larger and plumper than it really is. Generally speaking it is not a bold species but will gather in large mobs about any enemy and if the enemy wishes to make captures it will generally depart, as while minuta can see them the whole world knows where they are.

This species must be of enormous value to agriculture and especially to the natives in their garden culture as it searches all the cultivation plants if there is the least bit of cover about them and does the job very thoroughly. It apparently will eat some of the smelly types of insects as I have watched it searching in amongst pumpkin leaves and picking off pumpkin beetles and harlequin bugs. I have watched them push right down between the leaves of the European cabbage to capture some sort of insect. They eat paw-paw and one or two other fruits but except for the paw-paw do not seem to care much for fruits. Certain small seeds and berries and banyan figs form a fair portion of their food but they also are attracted to these by the insects which feed on them as well as the birds.

This species suffers somewhat from native persecution as it is easily snared in the snap snare the natives used on Lifu. (See drawing at end of Gen. Summ. Notes.) The children and youths and women are the worst offenders. Fortunately they do not constantly get the craze for a few days and catch them. The craze is then forgotten for some time till a kiddy sets it going again. This snare seems to be too complicated for a snare of native origin tho' it may well be native but I think it has been introduced to the island, probably by the sailors (European) who were wrecked on the island in the forties or fifties of last century and took unto themselves native wives and lived on the island for many years, some actually dying on the island. This species of Zosterops does not suffer as much from these snares as ornata nor as much as Aplonis.
Zosterops lateralis melanops:

This species is identical in habits with the other grey-

backed Zosterops of the Loyalties except that here on Lifu as on Mare the green-backed species takes its place in the forests but on Uvea the Grey-back which is the only one present on that island does go into the forest. On Lifu it does visit the forest but only very rarely or just as far as the extreme margins if these are handy to open areas and the bird merely goes there to shelter for the heat of the day or to roost at night, tho' it often roosts in low bushes far out in open areas or even quite close to tall forest. All other habits are otherwise the same. It feeds much on the berries of lantana and on other types of seeds and berries. It also feeds much on paw-paw and visits natives' gardens much to feed on this and other things. Like many other species it feeds on the blue berries of the vine which is common all over the island. It seems actually to be more of a fruit eater than minuta and it too suffers from native persecution from the snares. (Paw-paw being the favourite bait in this snare.)

Nesting habits seem identical with elsewhere. This species has a shorter breeding season than minuta probably only breeding from Aug.-Jan., nor has it the increasing powers of the smaller bird. It is often seen in pairs and seldom more than 6 in small flocks, 4 being probably the commonest number seen in parties. It sometimes, but very rarely, forms into large parties which call much and seem excited but these generally split up into the old small parties and go off in different directions. I believe 2 to 4 eggs are laid and the incubating period is something over 10 days. I only saw one clutch of 2 eggs and these seemed part incub. when seen and hatched out on the 8 day. Nest and site is the same as usual in this spec.

Zosterops inornata:

This species is confined to Lifu in the Loyalties, and is one of the commonest species on that island. Previous records of its habits are entirely incorrect and special observations by myself and concentrated study of the species are as follows and from these it will be seen that previous data about the bird was somewhat wide of the mark as regards accuracy. It appears to the observer that previous collectors must have obtained their specimens from the natives only and taken their notes from the same source as even today certain natives hold some of the ideas expressed by previous observers as to habits of the bird. This species is one of the birds which plays a large part in native mythology and folk lore tales and thus has some very strange and weird tales told about it.

The species is common in forests all over the island and is fairly common in low scrubs and visits native gardens a great deal to feed on paw-paw, which is one of its favourite foods. This species has a strange affinity with humans in that in the early mornings close about villages where the natives have their latrines it is to be found feeding near human feces. It appears to feed on the insects attracted to the feces (excrement) and even at times to actually feed on the feces itself. After a native has obeyed the laws of nature if one waits silent near at hand it is common to see the bird or a pair of them come silently down through the scrub and settle on the ground near the feces or in the shrubs close about and apparently snap up insects and sometimes apparently from it. It is doubtless from this habit that it has come to play such a large part in native mythology as the human feces

is one of the most sought after things for working witchcraft and such things in the native life. Apart from this the bird seems to be entirely a fruit eater, and if it is insects which it is feeding on at such times it seems strange if it does not feed on them to a larger extent elsewhere and at other times. I have actually observed the bird at these times and it appears to be feeding on insects but I could find no absolute proof of this (molluscs once or twice at other times and a rare insect) as the only one I shot in the act of thus feeding had an empty stomach when examined. It as far as I was able to make out only does this in the very early morning and at no other time behaves thus. As said before the species is almost entirely a fruit eater and lives on all kinds of fruit and berries. A food on which it lives much is the blue vine berry which has been introduced to the island, not unlike a small grape to look at and from which the natives make a serviceable ink for writing.

The species is to be found frequenting almost any kind of habitat which is not too open and garden lands if these are close to some fairly dense scrub or forest. It is commonly seen in pairs or singly and often in parties of four, and is often to be found in great numbers feeding on fruits of some type but these large gatherings are just a collection of the birds for feeding and in no way a flocking habit as each unit of from one to four birds keep themselves apart and arrive and leave together in forests, contrary to what was previously stated, they never go very high, unless occasionally they may go high where a banyan is in fruit if food was scarce, but I never once saw a bird at more than 30 feet from the ground and

seldom above 20 ft. and the greater number feed at heights up to 15 ft. from the ground. I doubt they ever go above the second canopy of the forest at 40 ft. unless as stated it is at times of food shortage, natives say it never goes above that level at any time and say it is a bird of the lower levels at all times. In low scrubs it feeds at all levels from the ground up to the top of the scrubs. In gardens it will feed as far up as the vines run on the dry trees left by the natives as long as these afford it good cover. Generally speaking it is a bird which keeps to cover. Its behaviour and habits are typically that of other species of Zosterops except that its movements are heavier and less active and slightly slower and more ponderous. It almost gives an impression of being weak in the legs and too heavy for good perching, as if it would overbalance forward. It is a rather shy bird and being silent or rather only having low calls it is easily overlooked. It is not uneasy to confuse it with Lichmera when it is in flight as it is fond of the diving and dropping flight, to gain speed, of that species. It is common to see it in the forests in the early morning sit in a patch of sunlight for a few seconds then move again into the shadows and again appear in the sun, not unlike the bird in a cuckoo-clock. Generally speaking it is a bird that prefers the shadows as one would expect from the sombre plumage it has. It is alert and constantly on the move, seldom remaining long in the one position, and is shy of humans and if it seems them will silently disappear. Its calls are only two. One call is exactly like the "cheep-cheep" of the domestic chicken and is about as loud as that of a small

two or three days old chick. It uses the same call much softer (not strong enough to be heard at a distance of 30 ft.) while it is feeding almost constantly if there are a number of birds in the vicinity but it will often feed for long intervals without a sound if there is a suspicion of danger about. The pairs, which are the commonest numbers seen, keep close together and keep up a constant cheep-cheeping to each other and also do this when in flight. The other call is like a low chuckle or hoarse guttural chatter not unlike a hoarse whisper or murmuring of the human voice, this is given in varying volumes but can never be heard at a greater distance than about 30 ft. and generally cannot be heard beyond 15 ft. from the birds. This call at times seems almost like a low chuckle of a human being with an almost evil suggestion of derision about it. The natives say a devil is in the bird when it gives this call and give it the name of Sinaming at such times, when it gives its more common chip-chip calls it is called by them Sinacoota and they say the bird is then only a bird. From the above and the fact of its connection with human feces it can well be understood why it plays a large part in native folk lore and mythology.

The species breeds late in the year, I believe from native accounts. I could find none breeding during my stay and saw no nests. From what natives say the breeding season is from Nov.-Jan. or early Feb. Being a fruit eater and these months being the best season for fruits it seems very probable that the natives are right and these months are the season when it breeds. The nest, the natives say, is like a large thicker clumsier edition of the grey-backed species, and is generally

decorated with tufts of cotton and such materials. It is, they say, generally placed in a thick clump of vines or leaves and seldom higher than 10 ft. from the ground, though it is, very rarely found as high as 30 ft. but in such a case is invariably close in against the trunk of a tree thickly smothered in vines. They often nest within three feet of the ground and from 5 ft. to 8 ft. seems to be the favourite height at which they build. Eggs are two and whitish with some other shade which the natives seemed indefinite about but which from their accounts seems to me to be a very pale salmon-pink. There is considerable doubt about that though, as some natives seemed to think they were more of a bluish tinge like other smaller Z. but others seemed to think there was no suggestion of blue. It seems certain it is a plain egg with a faint tinge and that the egg changes color during incubation. Incubation probable takes from 12 to 15 days, though that seems uncertain as some natives said 8 and others said three weeks and as I had no opportunity of verifying the matter I only give the above figures as they seemed to be the ones thought to be correct by the majority of fairly reliable observers. Only one brood is evidently reared in a season and the young stay with the parents till close up to the next breeding season, these are probably the parties of four seen so commonly. The single ones seen are possibly young unmated males. It speaks well for this species' ability to avoid its enemies that it is such a small breeder yet is one of the most plentiful species on the island. It is a most unobtrusive bird and till an observer becomes acquainted with it, it will be present but overlooked by him. When I first arrived I looked

in forests further afield for the bird but later found there were great numbers within a hundred yards and even at the very door of my camp and they had been there all the time but had been overlooked. They certainly were more plentiful in the forests but they are quite common anywhere that the habitat is not too open in nature and there is some fruit or berries present, but they will be very easily overlooked as they keep to the shades and covers well or make their plunging flight across one's sight and are mistaken for Lichmera (plump males). In forests they often fly normally and straight but fast and their dull color makes them very inconspicuous and easily overlooked.

This species suffers a great deal from native persecution as it is exceedingly easy to snare and will come great distances to feed on paw-paw or pineapple to a less degree. If a ripe paw-paw is cut and thrown on the ground anywhere about where inornata is present they will come down and feed on it in no time. As paw-paw is the commonest bait they use in their snares the natives catch large numbers of these birds. Not all natives will eat them but some natives do eat large numbers and think them a great delicacy. Fortunately the snaring is not constantly carried on and is only indulged in sporadically.

As may be seen from the foregoing the two points of habit stated by Layard are wide of the mark and not correct today.

TRICHOGLOSSUS:

During my stay on Lifu I did not see or hear a single one of this species and though it is present on the island at the present time it is exceedingly rare. From the data I could collect from reliable native observers and from whites of long residence in the island, this is a bird that appears for a time and slowly disappears again. At wide intervals large flocks

seem to appear on the island and then start breeding but I believe numbers of the visitors return whence they came for some reason as yet uncertain. Observer believes that it is the presence of Accipiter in numbers on the island that causes them to depart. These swift flying parrots go into fits if a hawk of any description flies over where they are feeding. As they are rowdy feeders in the forest at most times they would be bound to attract the attention of Accipiter as it silently hunts from perch to perch in the forest and, as a general rule, these parrots look more overhead in forests for the attack. When some of them got down to lower levels to feed or a pair of them locked together in combat fell to the ground, there is little doubt Accipiter would make a strike and as, it seldom misses at such times, it possibly would make its kill and would possibly develop the habit of following this rowdy and easily located species. It is noticeable on Aneytium in the New Heb. that Trichoglossus only appears at certain seasons and never stays long whereas on other islands it stays and cononises. Accipiter has the habit of investigating calls in the forest and may even be lured within shooting distance by shutting a mob of chickens up under a case and leaving the mother outside and the cheep-cheeping of the chicks will draw Accipiter to investigate almost invariably, if they have not been caught and wounded by this method before. I can well imagine the calls of these noisy parrots would draw its constant attention till its hunger was satisfied anyway. From what I could gather on Lifu the parrot appears from elsewhere; this species travels in fine weather and is probably not one of the wind distributed types, and large numbers of them may be seen for a time; the east coast of the island seems to be the part most favoured by it, it only appearing at odd times on

the west coast. After a short while and very suddenly numbers greatly decrease and from then on only small mobs are seen in and about the island. They seem to favour coconuts and spend most of their time feeding on the flowers of that palm. By this time the birds are in small parties of up to a dozen but generally about four or five. When the next breeding season arrives they breed but their numbers slowly decrease till they are entirely gone or another influx boosts up the numbers again. Within the last twenty years there have been three large increases of numbers but today there are not more than twenty if that on the whole island. I found only one definite record of one being seen during my stay on the island and three records of sights of the bird during the last year, during the year before that sights were more common but not as common as a year earlier than that. It is, in observer's opinion, likely that this species being a fair weather traveler the birds on Lifu belong to the New Cal. race though it is possible odd ones at wide intervals appear from the New Heb. This species nesting in hollow limbs as it does, it is possible it shelters in such places during a hurricane and would thus minimize the chances of its being carried from island to island by hurricanes. It is possible such a swift and strong flier as this parrot is would cross the water gap between the Southern New Heb. and the Loyalties but it is more likely the crossings are only made to land within sight at the time of the flight and in good weather as I have only seen this species at seas in calm clear good visibility weather. Thus it seems much more likely that at least the majority of the birds of this species that appear on Lifu are from the New Caledonian mainland. It is certain at least that there is no indigenous species of Trichoglossus confined to the Loyalties.

Ducula pacifica tarrali:

As may be seen from observations made elsewhere in these notes writer does not believe this species is worthy of sub-specific rank and that they are from time to time mixed with fresh blood from other areas is evident; in some time past this has been a case of completely new establishment of the race, possibly, after it had been extinct or almost so on the island. Any size differences there may be in the birds from Lifu and elsewhere is in this observer's opinion entirely due to the shortage of good food on the island throughout the greater part of the year and actually the whole year if the food available on the island is compared with the food this species eats in other parts of its range.

It breeds on Lifu and its breeding habits here are exactly the same as in the New Heb. except that there it is mostly a mountain breeder. Its nest is identical and the same number and colour egg is laid. Breeding is spread out over a long period in individual birds of the species between the months of Sept.-Jan. and even Feb. and a little late if hurricanes destroy the earliest attempt to breed. The call, two kinds, is identical with the New Heb., a whirr sound deep in the throat or a deep com-hoo.

The species suffers a great deal of persecution from whites and natives and today I doubt there are more than four to five hundred birds on the island if that. There were considerably more a year ago but the local gendarme bought a new gun and during my stay he shot over twenty of them for the table and natives probably accounted for at least several hundred either for their own table or for white men's tables who will

pay them for them. A native told me that this year (1939) as they will be too difficult to find it is likely they will shoot hardly any till some years have passed then they will recommence shooting them wholesale again as they will be again common. I doubt the limb of the law will cease his attacks anyway not till the novelty of the gun wears off. The natives blame a French military garrison which was stationed on Lifu once for having wiped this species out some time during the latter half of last century but there was no one I could find on the island who could remember this, though the tale was generally current amongst the natives. The race disappeared in the early years of the present century and was reestablished after a hurricane in 1910 but was getting scarce by 1918 when a great number reappeared after a hurricane. Unless they are given peace or reestablished again they will soon be again in a very precarious position if not completely extinct on the island.

On Lifu this species eats principally a blue berry about the size of a small olive and not unlike a small thin plum in shape. Elsewhere in its range I have only seen it eat this fruit at times of extreme food shortage after hurricanes. Another food it eats is a round green fruit with a large seed and a hard pericarp. The whole fruit is a little bigger than a cherry and the seed forms at least three-quarters or more of the total of the fruit. The seeds are regurgitated and dropped on the ground after the pericarp has been digested. These fruits form its favourite food on the island and both are starvation foods elsewhere. All other food it eats on Lifu I have never seen it eat in other parts of its range even in times of food shortages. It does a thing on Lifu I have never known it do elsewhere and that is to descend to the ground and

feed on fallen fruit there when the fruit on the trees is finished or nearly so. At such times it will eat fruits it has recently refused to eat on the trees. This shortage of food makes it a wide-ranging bird. Its presence will be reported in numbers in one village area for a week and next week there will not be a single bird in that area but it will be found plentiful in an area somewhere else on the island. The only area where it seems to remain permanently, though even here for much of the year there are only one or two to be heard or seen, is in some of the tall forest in the centre of the island south of Nung. It breeds mostly in this area and that is possibly why a few are generally to be found there. Also in this area there are possibly more of the blue plum fruits than elsewhere on the island, much of the forest there being the trees that produce this fruit.

INTRODUCED BIRDS:

Some time early in this century or in the early tens of the century, just before the war I believe, though natives say about 1918, (there are no official records of the attempt but the only man I could find that assisted at the attempt was not sure and he thought it was just before the war. This is likely as it was then the crow was introduced to Mare, on Sarasin's recommendation I believe, and it is possible he also recommended the importation to Lifu to make sure the race did not become extinct) about 100 to 200 (released in 100, 50, 50.) Nymphicus were caught on Uvea and brought to Lifu in a steamer and released. All releases were said to have been made in one month from the first lot to the last. The exact

number released is uncertain as there were some deaths but a large number were surreptitiously taken to Noumea or sent over seas though it seems likely well over the hundred were released. From the day they were released they have never been seen on the island and in observer's opinion, as a great number of adults were amongst them, they simply led the whole jamb bang lot straight back to Uvea. When released it is significant that some did the most unusual thing for this species, that is flew almost straight up in circles till they were almost invisible then headed what watchers thought was inland but might well have been towards Uvea. All did not behave thus, a few being seen in the forests close to where the release took place but these were not seen the following day or any day thereafter. It is not inconceivable that some of the birds were brought over twice. It is worth noting that residents on Uvea at the time remarked on the fact that the wholesale exportation had not decreased the numbers of the birds one saw about the place. The Lifu natives have never seen a single bird after the time of release and often wonder where they went to, saying they probable went back to Uvea and though they doubt the birds would be able to find the way they have probably got nearer the truth than the whites who accuse the natives of having destroyed the birds, or think that some day they will be found breeding on some out of the way part of the island. I ascertained from a native there at the time of the first release that the weather as well as he could remember was fine and calm, as to bring the large consignment over they had waited for fine weather so as not to damage the birds. This may well be so and the birds possibly

could see Uvea from an altitude of two or three hundred feet. It is possibly another case of a species with a homing instinct previously unsuspected in this species. If any bird made the passage more than once I would have liked to hear his remarks, if he could have talked, on the way home.

SNAP SNARE USED VERY SUCCESSFULLY BY NATIVES OF LIFU IS.

Probably a legacy from white sailors who were wrecked on the island and took native wives, some dying on the island, a few left with a relief ship and the descendants of all live on the island today and continue the English names of their forefathers. It is amusing to meet a native called Misjonson, Mist-hardy. (Mr. Johnston & Mr. Hard). The ship was an American whaler and many of the descendants still speak English and on meeting one say "Me American Man." Representing the A.M.N.H. I was welcomed with open arms as one of themselves. Strangely they still speak of "their presidents" as the ones who were in power about the 50's of last century.

MIMICRY BY BIRDS ON LIFU IS.

Generally speaking there appears to be little mimicry indulged in by the birds on Lifu. The best mimic is probably Gerygone which I have heard mimic the following species, Pachycephala, Philemon, Lichmera and Zosterops minuta, and only once I heard it mimic Rhipidura and Myiagra. Naturally all its mimicry is very subdued and not very loud. Aplonis very often. Lichmera often mimics Aplonis and Pachycephala and does it fairly well.

Gerygone mimics Erythrura exceedingly well and has often misled me into thinking that species was present when it was not.

There are a number of other calls different birds give which sound rather like attempts at mimicry but they are rather indefinite and I hesitate to call them definite cases of mimicry.

NO. 4. ZONES OF BIRD LIFE ON LIFU IS.

There are no true zones of bird life on Lifu other than such as naturally exist anywhere between the birds of the sea-shore and the interior of the island. Owing to the mixed way the habitat on the island is nowhere very extensive in one continuous area and the greater part of any variation that is met with is not sufficiently wide in difference to cause any birds to say definitely confined to one especial part of the island, there is no district preference shown by the birds of the island. Such birds as may have refused to go into the open type areas owing to the mixed placing of the different types of habitats have been compelled at times to cross the habitats unsuitable to them and have thus lost their fears of such places as barriers to their progress to fresh feeding grounds. Doubtless also the droughts and seasons of shortage of food have tended to make the birds wander further afield in search of food and they have quickly crossed the places of unsuitable habitat and having to do so fairly frequently they have to some extent lost their fears of such places, besides it is possible if such areas have held suitable food for them they have remained in them till times of normality have returned to the island. One may meet any species of land bird anywhere on the island almost. There is one thing noticeable and that is that generally speaking the number of birds per square mile is considerably greater on the East side of the island than the West, this is probably something to do with the rainfall being heavier over that side of the island and vegetation slightly more luxuriant. Also the soil generally speaking on that side of the island is more fertile than on the west side. Whites

living on the west coast often have their vegetable gardens on the east coast and visit them from time to time in their cars, merely paying a native to attend to them in the intervals.

Should any other collector ever visit the island I would advise him to make his main camp at Wei (French. We) and work from there as he will find the collecting much easier and the distances to travel to all types of habitats much less than in the rather dry districts in the west of the island.

NO. 5. NOTES ON INDIVIDUAL SPECIES.

No. 1. NOTOPHOYX novaehollandiae. (Latham.)

This species is entirely unknown on the island both to whites and natives. Some natives know of it in New Cal. and are very sure it never appears on Lifu. If it has ever appeared on that island it has been purely by accident and the birds would not stay beyond the first day of sufficiently good visibility for them to see N.C., if as long as that, and N.C. is visible on the greater number of days of the year. Under no circumstances can it be classed as a bird of Lifu.

No. 2. Demigretta sacra:

This species is more common on the island than at first glance appears to be the case. Owing to the formation of the island one seldom visits the lower ledges where they spend most of their time except where the main road follows the coast along the east coast of the island and here the birds are probably below one's range of vision hidden behind the ledge of coral rock between high and low tide marks. Though it must be said the times I looked along that coast there were none present. When one passes close to the coast in a boat it is then one sees how plentiful they are, but even so they are not as numerous as

on Uvea, though more so than on Mare Is. It breeds on the island in numerous spots and especially in the pine trees on Cape Pine on the east coast. The white phase seems quite unknown on the island, and the mottled phase is also unknown. During my stay on the island I saw little of this species as my field of work generally speaking was not in places where I would have been likely to see them. From the little I saw of them and what I heard of them they seem identical with the species elsewhere in their range all habits and breeding seasons being the same. From the time of leaving Uvea to the time of leaving Lifu the sight records of the species were as follows: All 1938.

Within the lagoon of Uvea 24/6/38. 2 blue

Lifu: Coasting in cutter saw 1 blue Demigretta. 25th. June
 East coast of island saw 2 blue Demigretta. 19th. Aug.
 East coast of island, saw none in full day, 5th. Sept.
 West coast of island, when coasting along coast on
 leaving island saw 11 blue Demigretta.

The above cannot be taken as an indication of the rareness of the bird on the island as these represent the only days on which I was really where I could see the birds. Once one has climbed to the plateau of Lifu one is more or less outside the range of where one is likely to see the bird. The day spent along the east coast was not a fair indication as the weather was very rough and that was the weather side of the island and it is very likely had I been on the lee side of the island that day I would have seen more than usual for that side of the island. The natives know the bird well and are fond of it for eating in certain parts of the island. It passes from island to island of the group as it does in other groups and I have no doubt there is some passing

back and forth between the Loyalties and the New Heb. It is a species that is often attacked by Falco and may sometimes be driven to sea by it.

No. 3 Anas superciliosa pelewensis (Hartlaub & Finsch)

Though this species is recorded as being present on Lifu, I very much doubt it ever appears there except as a migrant passing through from the New Heb. to New Cal. There is no surface water anywhere on Lifu and rain water disappears within a few hours of its having fallen so there is nothing to encourage the birds to visit the island. It might possibly rest on the shores of the island when en route to other places but this must be a very rare occurrence as the bird is entirely unknown on Lifu and I could not find a single record of a native, even the oldest men on the island, having seen one. It is more than likely that confusion has arisen and birds from Uvea have been mistakenly labeled as coming from Lifu. By no means can the bird be called a bird of Lifu Is. and any accidental occurrences of the bird on that island must be at extremely wide intervals.

No. 4 Accipiter fasciatus vigilax: (Wetmore)

This species is very common on Lifu though it is no more common than it is on Mare or Uvea comparatively speaking. Its habits and behaviour are identical with the other islands and need not be gone into fully for Lifu as they have already been done for the other islands and what is true of those islands is true of Lifu if slight differences of locality are taken into consideration. During the greater part of my stay it was noticeable that the females were very much in the minority as they were brooding, later they became increasingly common as the young

were hatched and the females began hunting. The greater part of the birds breed in August some breed somewhat earlier, some even as early as late June but these are rare but all are building nests by that time. A fair number begin to lay their eggs in July and the rest lay in early August. I am not sure what the incubation period is but believe it is between three and four weeks, probably about 24 days. The young when hatched are small downy balls and the down remains for a long time the last of it on the head has not completely gone when the birds first leave the nest. I saw two nests with young and both nests had only two young in them but natives claim to have found four eggs and even four chicks. I saw no eggs but from bits of shell seen about the nesting tree I should say the eggs are a dark brown, the bits I saw were light brown but appeared to be faded in color, with large dark reddish blotches on them and a small pinpoint red spotting all over the shell, almost as if the pinpointing were a part of the texture of the shell. Both nests were identical with the nests described on Uvea Is. and one was 60 ft. and one about 80 ft. above the ground. I saw several old nests not in use which varied in height from 30 ft. to 90 ft. above the ground. All had selected a tree that had flattish rings of branches and all were built in against the trunk of the tree not far from the top of the tree. While examining nests the parent birds were invisible and I believe entirely left the area. The nests examined were seen in early Sept. shortly before leaving the island and by the size of the birds I should say one lot were hatched about the middle of Aug. and the others were only about a week old so had been hatched in early Sept.

Other observers have remarked on the preponderance of imm. but this may have been not from field observation but from the

numbers of skins in collections as it is just possible that collectors have found it easier collecting imm. than adults in this exceedingly shy and alert species. It also may be because at first the smaller males were thought to be imm. in this observer's opinion imm. are not more plentiful than adults and the position is quite normal. Certainly during my time on Lifu the imm. were conspicuous by their absence and it is my opinion that the numbers of imm. is quickly reduced by natives and whites shooting them when attacking domestic poultry. Also from what natives say the mortality in nestlings is heavy as they fight like fury in the nests and it is not uncommon for young to fall or be pushed out of the nest and killed by the fall. They say it is seldom that more than one imm. is reared but in my opinion there are usually two reared and each parent looks after one. Though it is a fact I have never seen a male with a young one it was looking after. Natives say that the female drives the male away from the nest after the young are hatched as it will eat the nestlings if it is hungry. It is worth recording that on Lifu I once saw a female chasing a male and she certainly meant business, but in my opinion that was a foreign male and not mated to her. I have seen a male and female sharing a kill in the nesting season on Lifu and that does not look as if they were at enmity though it is just possible the female would not allow the male to go near the nest.

A fine example of the cunning of this species is to be seen at Wei and I believe elsewhere on the island in the connection the bird makes between the church bell and the

absence of natives about the place. It is very noticeable that if the church bell is rung loud and long the Accipiter seem to know it signifies that there will be few natives about as they are all in church and it is at such times that the species gathers in numbers to attack the natives' chickens. I have actually seen as many as five in the village at that time though even they they do not abandon the great cunning and caution they exercise at all times. Natives know of this habit and certain of them who have suffered from attacks by the bird borrow and gun and hide very carefully instead of going to church and often get the bird which was annoying them, though more often than not they fail as unless the bird nearly sits on the barrel of the gun they will not shoot and if they do shoot they only wound it and the bird becomes even wilder than ever. At least it is likely the bird will forsake the locality for a time. When I was there I tried to take advantage of this habit of the bird but it was noticeable that the moment a shot was fired all the birds left the vicinity and after about three or four days of this the birds seemed to know and would not come at all. I noticed sometimes they would perch at a great distance and look the place over but would not chance coming any nearer. Very rarely one would fly high over the place but they would not make any attacks on the chickens. I have no doubt that they are back to the old habit again and the chickens get a bad time during the time the owners are in church. Some natives say it is hardly worth while trying to rear chickens anywhere near that place and some of them keep their fowls at some considerable distance beyond the sound of the bell. They say that though they lose quite a number of

chickens even there they do considerably better than near the bell, as where the bell can be heard the hawks immediately make for the nearest place where there are chickens and after a good look about they attack any they see.

Though this species is almost completely silent and apart from a shrill sharp short whistle like "Kreck" occasionally uttered when the bird is wounded in flight or gets a very big fright it is almost voiceless. I thought it had no calls at all but on Lifu I heard it give a number of calls so it must only call at the breeding season. These calls I heard were two, one a low hoarse chatter or murmur, exceedingly difficult to describe, made when on a kill when another bird is in the vicinity. This call cannot be heard at more than twenty yards away. The other call is louder but cannot be heard at any great distance; the loudest call I heard, and that seemed to be at the full strength of its voice, could not have been heard at 150 yds. and I very much doubt it would have been heard at 100 yds. In my opinion the limit at which it could be heard is about 80 yds. and it often gives the call so low that it cannot be heard at 50 yds. This call is a weak thin enquiring sort of petulant whistle. It almost seems to carry a note of "hey where are you" about it. I also heard this same call with a note of rage in it once when I saw a bird make an attack and miss the Chalcophaps it had made its silent swoop at from a perch in a nearby tree. It does not often miss its swoops and in this case it may have been that it saw my movement as I raised my gun and the movement may have distracted its eye for a moment. Even when I fired at it and it fell wounded with a broken wing in the forest

near by it did not utter a single call. I did not find it till two days later the smell led me to it and it had died fully 250 yds. away from where I shot it. It was a male adult and actually I have never seen the female miss a strike nor have I heard any other of the birds utter this call of rage. I have seen other males miss their strike but have not heard them give this call but this may have been because I was at too great a distance to hear them. One thing is sure they only have a very weak voice and they seldom use it.

The native name on the island for this hawk is Whaken and the name for Circus is Whuzu, but the natives for some reason often refer to Accipiter as Whuzu though they straight away admit it is not its name. If a native were to rush to tell me there was an Accipiter attacking his fowls and to come quickly he would probably say "Quick master one Whuzu" or more briefly just "Whuzu" yet if I query "Whuzu? Whaken?" he would promptly reply "Whaken". It appears to be purely laziness or carelessness which has caused this custom to grow up. It is noticeable that the old men and the chiefly cast, and they have an aristocracy of these on the island, always use the proper name for the bird. These double names for birds I at first thought was due to the fact that the aristocracy have a language of their own and a commoner in the old days did not know this and if he wished to approach a chief with a petition he had to get another one of the chiefly class to interpret for him. Today on the island few outside the chiefly class know this language fully though some know odd words of it. It is dropping into disuse. I later found that the bird names did not enter into the language, so any change in there is due to natives' laziness or slight

differences in the language on each side of the island. On Lifu this species hunts in all types of habitat and is common all over the island. Males and females show less tendency to keep to the one type of hunting ground than they do on Uvea, even so there is a tendency for the males to favour the forests for hunting and the females to favour the more open types of habitat, for just flying and playing on the wind both species prefer the more open places. One will of course find females hunting in forest and males hunting in the open but the preponderance of the sexes seen in the two types of areas will be as indicated above. It is perhaps worth mention that there are more females seen hunting in the forests than males seen hunting in the open places seemingly showing that the bird prefers the more closed type of hunting habitat. Birds not hunting but just flying in play cannot be confused with the grim stalker which the bird becomes when it is hungry and commences its silent hunting through the country, moving silently from perch to perch till it sees something to attack. Then the long motionless perch, being almost invisible as its color seems to blend perfectly with any background, then the silent moveless glide and the almost certain kill. Here as elsewhere it flies up and looks about while it is devouring the kill on the ground. Only the very smallest of kills perhaps such as a small lizard are eaten in a tree. The bird does not carry the kill to the young but as far as I could make out with a poor pair of glasses, (necessarily at a great distance with such a shy species) it fills its crop with torn meat and flies with this to the nest, regurgates this for the young and after a few minutes returns to the kill and fills up again. I did not see a male approach the nest while it was under observation. I have never seen

this species carrying anything in its claws when in flight and I doubt it ever carries food to the young in this way.

It seems evident to me that the imm. do not carry the imm. plumage a full year or I would have seen more imm. when I first arrived on Lifu. This would mean that imm. do not breed, though it may be possible that the imm. commence to mate while still in the imm. plumage if they breed in the first year, a thing I very much doubt that they do. Only by a full year's observation of certain definite birds in one definite area could this be proved positively and a man in Mr. Freeman's position on Aneitym could probably do this. That imm. may carry on the first year plumage a little beyond the first year is possible but from what I saw of the species in the Loyalties I very much doubt this. Actually the whole of my stay in the Loyalties was singular in the absence of imm. seen by me at all, and the number of adults was very much in excess of the correct ratio for the adult and young of the species. I do not believe the native and his gun, and few have guns that they can carry openly though many have them on the blind, are responsible for the absence of the young, as even the young birds are wide awak and they do not shoot too many. Besides if they were out to exterminate the race they would destroy the young when they found a nest, whereas at present they are too lazy to bother to climb up and kill the nestlings. Actually from the appearance of things when I first arrived on Lifu one would have been led to believe that the bird did not breed on that island. Possibly Layard was on the island just after the nesting season and imm. were common and all the adults were far in the forests in secluded

places going through their moult after the breeding season. The species moults irregularly but the bulk of them moult after the usual breeding season. I am not sure but I have an idea that the old birds of this species beyond a certain age may not continue breeding and it may be that these are the birds that show the irregular times of moult. I found on Mare several times birds in heavy moult hidden well away in quiet corners in the forest as if they wished to avoid notice and this was in Jan. and Feb. the months when one would expect the majority of the birds to be in full moult.

The following are some of the records of Accipiter seen on Lifu but do not include every bird seen though they represent probably 80 to 90% of the birds seen during my stay. As I spent a good deal of time in camp skinning, this in the early days on Lifu represents only birds seen during the early morning though that is possibly by far the best time to see the birds. It was noticeable that on Lifu as on Uvea the birds seemed to have a fairly regular round for their morning's hunt. If one were seen at half past eight at a certain place it would probably be seen in the same locality at about the same time the following morning. This would of course be upset if the bird gets its kill at an earlier hour as it would then probably go off playing on the wind after a few minutes perching to start digesting the food. (See Uvea notes this species).

June. 1938.

28th. One seen since arrival on the 25th.

July

2nd. Saw one male one female on wing over low scrubs, playing on wind.

- 3rd. One male seen stalking natives' chickens near camp.
Very shy.
- 7th. Saw one male on wing over low scrubs, probably same as seen before.
- 8th. One male imm. 1/4 plus, much abraded shot in same spot as one seen previous day and half an hour later than sight of previous day. Probably the same one as I moved over under the spot I had seen him the previous morning and waited half an hour or so. I got my shot but it would have been possible to have got him from the same spot as I was the previous day as he passed about midway between the spots, that would be as it was a long shot about 60 to 70 yds. to the side of his course the previous day. On the same day I have the following note. 'In field all the Lifu birds appear a smaller race than elsewhere, is it possible they are a separate race? Further material necessary. Later I was not of this opinion and realised it was only because there were such a large proportion of males and imm. amongst the birds seen at this season in comparison with the normal times when both sexes are hunting.
- 18th. One male ad. 1/1. shot 9 am in area where natives had told me of its regular attacks on domestic chickens.
- 19th. Shot at one A. male and prob. male ad. but failed to find it in the dense scrubs bordering the track. This bird was found later far away. I had once before seen one near this spot. See other previous notes on this species in regards calls.

20th. Saw one A. male far away on wing playing on wind.

22nd. One A. male ad. $3/4$ test rec. used. Probably same bird seen the previous day as it was shot in the same spot and about the same time. I left my skinning table to go to the area and was successful. On the same date I have the following note. "To date observer has noted an absence of females, these may be brooding at this season. According to other observers (E.M. notes) juveniles are common. It is not so in my experience and it may be that previous observers mistook ad. males for imm. because of their smaller size which is very noticeable when are in flight. If it is from collection data and there are more imm. in collections than adults it may be that other collectors have found imm. easier to collect as they are slightly less wary than adults. This collector has found little difference in adults or imm. as regards collecting, both being damn hard to collect.

27th. One A. male ad. seen staling domestic chickens at a village.

29th. One A. male ad. seen but chance shot missed. Poss. same bird.

August

2nd. One A. male ad. full breeding, (T. 20 x 12 mm.) collected. Warning was given as usual by domestic poultry and I left the camp and was successful. I have no doubt this was the bird seen attacking the chickens on the 27th and on the 29th and it is worth

noting that all the times he was seen there were between three and four o'clock.

17th. EAST COAST CAMP.

Noted A. hunting in light rain but immediately the rain became heavy it perched and hunched itself up to guard against the rain. It had perched in a bare dead dry tree, much exposed, in a second year garden. Saw three other A. all males in the run across the island by car. This makes four sight records for the day. The bird hunting in the rain was a female ad.

18th. Saw four ad. males and one ad. female A. They attack the natives' domestic poultry to a great extent hereabouts. Natives say it is no good trying to rear chickens here and most of them keep their chickens at other places, surely A. have enough sense to go to the other places, also.

20th. Two male ad. and one female ad. seen. Who said imm. were more common than ad. Nutz natives tell a strange tale in this area. That Accipiter know the sound of the church bell and that the birds know that the people will be in church and they can attack the fowls and chickens without fear of reprisals from the natives. First time I have heard of birds getting religion but as it is Sunday tomorrow and the bell will be ringing I can test the native theory myself and will keep a good lookout.

21st. The natives are right. A. evidently associates the sound of the church bell with the absence of natives.

By climbing a tree on the cliff edge at the landward edge of the coastal flat I could see over a great deal of the coastal flat where the villages are, the houses being scattered about amongst the coconuts which cover the greater part of the flat hereabouts. The church bell was rung for about half a minute at 8:30 am but I saw no A. From 8:45 am till 9 am the bell was kept constantly ringing and during that time I noticed that two A. appear over the cliff edge some distance along from me and drop down unobtrusively into the coconuts of the coastal flat. After the bell stopped ringing I saw three more go down to the flat. Although the movements of the birds were hard to see from on the cliff-top and only occasional glimpses of one were seen now and then it was easy to follow the course of the birds by the alarmed calls of the fowls as they sighted the birds sneaking from palm to palm looking for a chance of successfully attacking an unwary bird. It is of interest to note that the first attack or actual swoop came at 9:45 approx., so the birds must have waited a long time on the perch so that their presence had been forgotten by the fowls if they even ever know of it. This attack took place about 150 yds. from me and almost immediately below me and had the bird been moving about much I would have seen it. I had seen a bird stop somewhere thereabouts while the bell had been ringing so that it had evidently waited the best part of an hour to attack. I know the fowls had known of its presence because they had nearly had hysterics when it first arrived

arrived there, but they had settled down and stopped calling evidently having forgotten its presence. I left my post in an attempt to shoot the bird while it devoured its kill but was not successful. During the time I was away I heard two other attacks take place further away along the flat. When I returned to the cliff edge there were no signs of the birds and it was noticeable that there were no more alarms from the fowls in my vicinity and the hawks evidently knew of my presence. I sighted two others at some distance away but heard three other attacks at different parts of the flat. The people came out of the church at about 10:30 and it was noticeable as the people passed along the road their progress could be judged by the A. which could be seen leaving for the bush of the higher plateau as the first of the people reached their vicinity. To my amazement I saw 8 A. leave the flat and there were possibly some others I did not see so there were probably at least ten of them on the flat below where I was. As far as I could make out they were all ad. and there were 6 females and two males. This seems pretty conclusively to point to the natives being right and I can well believe they are as it is an exceedingly cunning species. Later natives told me that they trade on this habit of the bird to try and shoot ones that are worrying them by not going to church and hiding well and often see the bird even if they don't get their shot and they say that if they fire a shot every bird on the flat

immediately clears out and does not return for a long time. Some of them tell me that they waited for over an hour watching a bird perched absolutely motionless all that time in a palm waiting its chance of a successful attack. Will try and take advantage of this habit of the bird.

22nd. One female ad. seen hunting through forests.

23rd. One male ad. seen in forests.

24th. A male and a female A. seen in dense forest. I heard these birds give a low call. They were on the ground at a kill, a full grown Chalcophaps, and were uttering a low petulant murmuring call not loud and not to be heard about 30 to 40 yds. When disturbed they flew up into a low tree and one was shot but I failed to find it in the dense fern of the forest. The ground was very rough and irregular and much coral rock and pockets and it is likely the bird fell head down into a narrow crevice. The other bird lit out for the horizon at an express rate showing they know what a gun is.

26th. During natives' prayer meeting after the bell had stopped ringing I saw several A. and shot one which was perched in a banyan watching domestic chickens. This was an adult male in full breeding (T.lt. 25 x 12 mm. & 1.95 gm. rt. 27 x 13 mm. & 2.25 gm. Total weight two testes 4.2 gm.) This bird was shot during a light shower and when shot an adult female previously unseen flew from the other side of the same tree. A quick snap shot with the other barrel at long range

failed to drop the bird though it was evidently hit pretty heavily.

27th. Two A., one female one male both ad. seen. One, the male, in forest land and the female was seen on the margin of forest and savannah or grassland patch. Too wide awake for a chance of a shot.

28th. Crossing island saw 5 A. all adult (2 f. 3 m.)

29th. Two A. seen one male ad. and one female ad. which was shot. The male was seen in forest land hunting silently through the trees from perch to perch but offered no chance of a shot. The female shot was collected in the coconuts near the village where I was camped and had its leg badly shot damaged and gangrenous and was very thin and weak. Even badly injured as it was it is of interest to note that it was attacking domestic chickens very savagely when shot. This is probably the bird I had wounded on 26th. It could not use one leg as it was broken. It had probably tried to make a kill amongst wild birds but had failed and it had returned to try its luck with the more easily caught domestic chickens.

September

2nd. Shot one female ad. full breeding, probably has young in nest, when returning to camp at five o'clock. It had been attacking domestic poultry. I had noticed this species was evidently tumbling to my idea of waiting when the church bell went and was fighting shy of the place or was only approaching with extreme caution. The previous Friday I had noticed when I fired my

double that every A. had cleared off the flat. On the following Sunday while I was crossing the island I had paid a boy to keep a watch with my gun and he had reported the birds exceedingly shy and wary and though he had one long shot he before firing had thought it too long a chance of a kill, and the natives reported an exceeding and unusual absence of the species in the area for the Sunday. This day a boy was on the watch during the prayer meeting and he reported not having seen a bird on the flat all day though he had seen several over the cliff edge but all had sheared off and gone back into the forest. Somewhat south of the church I shot this female sneaking through the coconuts and natives told me they had seen it very furtively sneak out of the forest towards the village and it just so happened it crossed me on my way home. The natives reported that twice that day they had seen it come out of the forest and soon turn back as if it were expecting danger, and even the last time it came late in the day it seemed to be very scared and on the alert and took some time to make up its mind to leave the vicinity of the cliff and forest edge, but after long looking about it flew a short distance across the flat returned to the cliff and a little later again set out across the flat and evidently made up its mind that there was no danger about and made its stalk and kill. It was headed for the forest at full speed when I saw it, evidently having been disturbed by our approach and it took a double to bring it down. I have

wondered if this species can smell a dirty gun as I have noticed it is hard to get close to birds except up wind with a dirty gun and it is seldom that one walks on the bird unawares from up wind if they are carrying a dirty gun, but they often come on them suddenly if the gun is clean or no gun at all is being carried. I have noticed I have more success with this species if the gun is clean and it is not a bad idea to carry a pull through well soaked with oil and have clean rags to pull through and keep the oily rag in a very tight tin so there is little smell, or better still throw the rags away and use fresh ones. It may only be coincidence but I believe a clean gun in country where this species is, is conducive to more opportunities of getting possible shots at them. Even so the greater number of shots will be fast and possibly long shots, except when the bird can be successfully stalked but for every successful stalk one does there will be five unsuccessful ones very likely.

3rd. One female ad. shot. At the time this bird was shot it was in an area where the attacks on domestic poultry are frequent yet it did not appear to be very wide awake or to be attacking or hunting chickens. By its behaviour before shooting I would have taken it for the less wary imm. by its behaviour before shooting I would have taken it for the less wary imm. by its behaviour but it was an ad. female passed breeding and possibly with young at the time. Its stomach showed it had been eating more natural or bush food. Its plumage is in such a condition and the age of the bone

in the skull makes me think this bird is not long out of the imm. stage. It seems likely that the species may actually mate in the imm. phase and even copulate. It probably breeds in its first year, and undoubtedly breeds in its first year of adult plumage, and as I believe it loses its imm. plumage before the age of 12 months in most cases it is likely it breeds at twelve months. It is possible as it seems an irregular moult in individual cases odd ones in imm. plumage are found breeding, though I think such cases would be rare and the greater number only breed in the ad. stage. It will be remembered I collected an imm. on Aneityum which was in well advanced breeding, the gonads being enlarged and it is likely that this bird would have bred the following Aug. or a little later. It may be that the males retain the imm. plumage longer than the females and they may not mate in their first season.

5th. 2 female ad. seen playing on the updraft of the wind on the cliffs of the east coast much as they do on Uvea.

No. 5. Hypotaenidia philippensis swindellsii: (Mathews)

Very common all over the island and especially about native gardens and villages. Seems identical and elsewhere in the group in every way. See notes also under Gen. Summ.

No. 6. Porzana (Poliolimnas) cinerea tannensis: (Forster).

Was once exceedingly common all over the island but is very very rare now if not already extinct on the island. See notes Gen. Summ.

No. 7. Porzana tabuensis

Was once more common on the island than it is today. It is present today on the island but is not very plentiful and is very seldom seen today. See also notes under Gen. Summ.

No. 8. Porphyrio albus caledonicus: (Sarasin)

Was never very plentiful on the island but was much more common than it is today. During my stay I saw none and no evidence of their presence and only two reports of their presence on the island came to hand from an island-wide watching service. The bird on Lifu is evidently subject to influxes of birds from other areas at exceedingly long intervals, probably from N.C. at times of drought or scarcity of food in that area. See also notes Gen. Summ.

Mayr's Query: Woodland (?), Second growth (?) Swamps.

Answer: There are no swamps on Lifu and never have been in the memory of man. There are no conditions even approaching swamp habitat in the length and breadth of the whole island. From what natives tell me the species on Lifu favours the margins of the forest close to the gardens, especially second year gardens which are under bananas and sugar cane etc. on which it feeds but numbers are so few that no appreciable damage is done. These gardens are only visited at wide intervals as there is little work to do in them and consequently they are quiet places and favoured by this shy species. Natives today know of no flocking of the birds together or the forming of bands which tour the country as they do in places where they are more common.

No. 9. Ptilinopus greyi: (Gray)

Common all over the island. Feeds much on the small figs of the banyan and on other fruits. It also feeds on the blue plum on which Ducula feeds. It suffers somewhat from the natives who snare it and shoot it quite a bit. Is also subject to persecution by French residents as there is little work or difficulty entailed in shooting large numbers of it for the pot. It is not wild and will return time and time again to a tree out of which some others have been shot only a few minutes before. Its habits appear identical with elsewhere. It has the same pissy smell which is characteristic of the race elsewhere in its range. It lays the same number of eggs as elsewhere (one rarely two.) and has the same breeding season. Calls and all else are identical with the New Hebrides.

One very old native told me that in his youth it was often said that this species was not always present on the island but that after a hurricane great numbers of them appeared on the island and since then there had always been plenty. No other native substantiated this statement though some had vague ideas of having heard some such tale. This was probably the oldest man on the island as his fourth grandson was living and was a man of a known age of over sixty. This old native claimed to have met Comm. Erskine in the late forties of last century. He said he was then a lad of about 16, this would make him well over 100 years old. He has an enormous family of descendants. He remembers a ship wrecked on the island an American whalter, the sailors of which settled on the island.

Mayr's Query: Habitat. - Mangrove (?), wood land.

Answer: The amount of mangrove on Lifu is infinitesimal

and nowhere does this species visit them. These are all found near the coast and P. seldom leaves the plateau.

No. 10. Ducula pacifica tarrali: (Bonaparte).

See extensive notes on this species in Gen. Summ. Notes. As you say I very much doubt this species on Lifu can be divided from the N.H. race and though after some years it probably becomes smaller in size on Lifu because of the lack of good food it no doubt increases in size again after a fresh influx of birds takes place.

No. 11. Columba vitiensis hypoenochroa: (Gould)

A very common species all over the island. It appears identical with the birds from the other Loyalty islands and local French do not think it in any way different from the bird on New Cal. mainland. Its habits in every way on Lifu appear the same as elsewhere, the breeding season being late in the year from Nov. to Jan. and sometimes a little later if hurricanes destroy the first nest. The nest is identical with elsewhere and one egg is laid, very rarely two, and the incubation period is usual.

The bird on Lifu is somewhat nomadic, large flocks of it being found in one area for a number of days while some fruit on which it is feeding is plentiful and then all move away as the food finishes. It is very noticeable that there is a great deal of individual variation in the sizes of the birds when a large flock is thus seen together. A favourite food of the species during my stay on the island was the small wide tomatoes which are found in old native gardens or any open patch which has at one time been forest land. When feeding on these it is

sometimes possible to get very close to the bird, tho' there is sometimes a bird perched high on a dead tree as a sentry, and it was noticeable that all the small-sized birds were not necessarily imm. as ad. with clear white chin patches were seen to be very small compared with others along side them on the tomato bushes. The species is often seen singly but is more often seen in pairs or anything up to a dozen and occasionally more. Calls are identical with elsewhere.

This species suffers a great deal of persecution from whites and to a less degree from natives. The five to six weekly mail-boat which calls at the island often stays a few hours and the passengers and crew sometimes go shooting and this is the species that suffers most, along with Ptilinopus.

Freaks with albinistic feathers are not common but do occur. I saw one which a native had shot for a Frenchman's table but the natives did not know of more than a few cases of such over a number of years. This bird was seen on the 19th July and I made the following note. Columba with very even broad white band across the tail, semi-albinistic feathers, under tail coverts were white washed with blue and upper tail covs. were mottled blue and white. The white bar across the tail prim. occupied from about 2 fifths of the way down the tail to a point about 4 fifths of the way down to the end of the tail. All other parts, wings, etc. seemed normal.

From my own observations on all the Loyalty islands I do not believe the race in those islands can be sub-divided and from the data I collected on Uvea I very much doubt that Sarasin's sub-spec. for Uvea can stand. My impression is that the race is subject to a food influence and the general average size of the birds on all the islands decreases very slightly

from east to west. The birds on Mare which is the most fertile being slightly above the average size of the birds from Lifu. Uvea may be slightly below Lifu in average size, but that I very much doubt as I believe there is a constant interchange of birds between the two islands. The bird shows considerable size variation on all islands and identical sizes at both extremes could be collected on each island, only in the general average size is there any difference and this difference has no significance.

No. 12. Chalcophaps indica sandvicensis:

This species is very common on Lifu and is rapidly increasing in numbers as it is thriving on the Cadjan or Pidgeon Pea. Lifu has more of this species than any other of the Loyalty Is. It is rarest on Mare, fairly common on Uvea and quite common on Lifu, but in no island of the Loyalties does it appear as abundantly as it does in the New Heb. On Lifu it reaches a ratio of about one to ten of what it does on Tanna in the N.H. and about one to five of what it does on the least fertile of the N.H. islands. It appears identical with the N.H. bird in every way, nesting habits and so on being absolutely the same.

It suffers somewhat from native and white persecution but as yet this is in no way a serious menace to the bird. Its natural enemies such as Accipiter probably account for a greater mortality in the species per annum than do humans. Native domestic cats gone wild account for quite a number, but the species is fairly alert and cats doubtless have many failures to catch it. Also though a native would consider the expense of a cartridge somewhat too high for a Chalcophaps they do not consider

it too high for a "pussy" and the cat is likely to come to a sticky end if he is seen by a native.

No. 13. Nymphicus cornutua uveaensis: (Layard) Introduced.

See notes under general summary. The species was introduced but in observer's opinion returned to Uvea almost immediately.

No. 14. Trichoglossus ornatus massena: (Bonaparte)

See notes under Gen. Summ.

The bird on Lifu comes from elsewhere and it is possible that both New Heb. and New Cal. races occur on Lifu and more frequently the latter.

Mayr Query: Does this species migrate from one island to another?

Answer: Definitely yes. On some islands regularly it appears and disappears. Aneityum for one island, Aniwa Is. is another. I believe if it were not for Accipiter this species would be common and constantly in the Loyalties.

No. 15. Cacomantis pyrrhophanus pyrrhophanus: (Vieillot)

This species is fairly common all over the island but is not anywhere near as common as it is on Mare Is. In fact the bird does not appear as numerous on the island as it should as host species are abundant enough to warrant a much larger population than is present. It appears identical in every way with the species elsewhere. Males seem to perch high and call much, while females are more on the ground or within a foot of it.

On Lifu it parasitises Rhipidura, Lalage to a great extent and I doubt it parasitises other species to any extent. It does very rarely parasitise Myiagra but such records on Lifu are at

wide intervals though on other islands such a host is not uncommon. Probably on Lifu the ratio is about 60% Rhipidura as foster parent and 38% Lalage. In Rhipidura the degree of parasitism would be about 5% of the birds on the island and in Lalage about 2% of the total of that species on the island. Natives say it was once much more common on the island than it is today, but admit its numbers vary over a period of years.

No. 16. Chalcities lucidus layardi: (Mathews)

This species on Lifu is subject to great increases and decreases in numbers at certain seasons. The natives admit this and say it is especially noticeable on the east coast of the island. When I first arrived the bird seemed quite common and usual, but shortly before I left the bird increased enormously in numbers. I shot quite a number of specimens at the time of the increase but I did not find any of them with wings of over 100 mm or other evidence of their being the New Zealand race passing through. I have little doubt tho' that the N.Z. race does pass through and it is more than likely the N.Z. birds being tired after their flight do not call much and are rather silent and retiring during the day. Their presence probably upsets the local birds and is the cause of much excitement amongst them but they themselves are probably very silent and retiring and would be difficult to locate or collect. Natives say they vary in the numbers in different years, some years only a few or no extra numbers appearing and in other years the numbers increase to an enormous extent for a week or two and excitement is great and much calling goes on and then their numbers become normal again. The seasons they give of these

increases in numbers coincide with the season at which one might expect the species to appear in their passage between the Solomons and N.Z. A small series were collected but these were all, I believe, the local race but the notes given hereunder are interesting as they were kept from day to day. As regards habits the species on Lifu is identical with the race in other parts of its range. Gerygone is the only foster species as far as I could ascertain but I had two unverified records from natives of the eggs of this species being found in the nest of Zosterops minuta but in both cases natives said the nest had been abandoned by the rightful owners. It is possible some native children may have been the agents by which the eggs got there. As elsewhere the males feed and call from the higher parts of the trees or scrubs and the females are more or less silent and hunt and keep low near the ground in the denser vegetation of the forests and scrubs. The females are seldom chased by the other species but the males often are, in fact I saw one case of a new nest of Gerygone where it almost appeared as if the male bird purposely drew the attention of the birds to itself and moved a short distance away with the birds much excited in pursuit of it. During this time I saw a female come quietly through the underbrush within a foot off the ground and mount to the nest as if it knew of its presence there. Apparently the nest was not ready for the egg as the bird, which I presumed was a female, just had one look and silently passed on. As I do not believe this species selects any particular mate but breeds or copulates with any male in the vicinity at the time it wishes to have the egg fertilized, it is in my opinion more than likely that in the above case the female merely took advantage of the occupation

elsewhere of the owners of the nest to examine it. The skull of this species seems to take a long time to ossify as there were no specimens collected by me with completely ossified skulls. That fact makes one wonder if it is not possible that much of the confusion and divisions in these species is not really due to different phases and ages in the life of the birds. Have any specimens of layardi ever been collected with completely ossified skulls and what are the measurements of their wings?

July 1938

2nd. Heard one C. calling.

4th. One C. seen.

5th. Chalcities common.

13th. C. seems very common and calling much this morning.
One male specimen collected. Repose. Skull 2/5 ossif.

18th. Note on this coll, calm, clear morning C. is calling very seldom and not at all before the dew and damp were off the grass.

23rd. Female specimen taken as usual near ground in low scrubs.
Well advanced towards breeding. Skull 3/5 ossif.

25th. Female specimen collected, repose or imm. and not yet breeding. Skull 1/3 ossif.

August

9th. Note C. calling much but cannot say I notice any definite increase in their numbers. One female spec. taken advancing towards breeding. Skull 1/4 ossif.

Note: When I came out of the bush on the side of the road after shooting C. on the way home a native from the other side of the island on seeing the bird in my hand volunteered the information that on the east side

of the island there was a similar bird but larger and not so afraid of humans as the small one (?N.Z migrant and very exhausted after long flight.) Another specimen female in full breeding collected with skull only 1/3 ossif.

From this date till the 18th, the usual regular run of C. were seen but nothing worth recording was noticed.

18th. Many C. heard calling, is much more plentiful here on the east coast than on the west coast.

20th. No proof of N.Z Chalcities yet in some 8 or 9 specimens shot and measured.

23rd. Note: Today C. have increased 100 to 150% in numbers tho' of 4 specimens shot all were with wings of under 100 mm. and seemed to be typical layardi. Possibly it is a district gathering for mating purposes, as numbers in small mobs calling much and greatly excited were observed in several places.

24th. Chalcities very numerous and calling much, numbers seem to have again increased. Could not prove any were N.Z. mig. as all seem identical with the others here and have wings below the 100 mm. Do not think these can be N.Z. birds but must be local birds mating. They seem to be in a state of great excitement and gather in parties of 20 and 30 and more seem to be joining them all the time. They call much, not their usual calls but shorter more excited notes. If they were migrants one would say they were preparing to migrate. This may be an old instinct making itself felt. Personally I have an idea these birds are nomadic or semi-mig. i.e. Northern birds move one stage south and so on.

Otherwise it is hard to account for its appearance on Aniwa and other islands of the New Heb. where its host Gerygone is entirely absent. At the regular times, it does appear in those islands, and just as regularly disappears again.

- 28th. Rode across the island on a push bike and wish to goodness I hadn't. Noted all the way across the island Chalcities was very very numerous and apparently still increasing in numbers. There has been at least a 400% increase in its numbers in the last four days. All very excited and calling much and gathering in parties. The enormous increase which has taken place right across the island and more so on the eastern side can only be accounted for by an influx from outside and tho' I cannot say I noted any difference in the birds I saw, it is likely the N.Z. birds are responsible for the increase. Actually I doubt I saw more than one or two per cent of the birds I heard calling when I crossed the island.
- 29th. C. still very excited, two were shot both had wings under 100 mm. and appeared typical layardi.
- 30th. In all areas visited today the number and prominence of C. was noticeable and their excited state, and much calling. Two were shot and examined but appeared like layardi except that one was exceedingly small.
- 31st. C. still exceedingly common and excited. The present population of this species on the island is far above what the island population of Gerygone could carry without about a 100% parasitism of the species.

September

- 3rd. Note Chalcities have greatly decreased in numbers and are calling less.
- 6th. Recrossed island to west coast and noted that the calls and numbers of C. seemed about normal and just as they were before the recent increase.
- 10th. Noted C. again increasing slightly in numbers on the west coast.
- 11th. Local resident on the east coast came across to meet the steamer and reported that C. had greatly increased on the 8th near his house and he had seen two in his garden where he had never known them before. They were still plentiful on the 10th but he had not noticed them on his way over this morning.

It will be of interest to record the wather during the times these above mentioned increases of birds took place and tho' the following is only rough it is at least an indication of what the weather was on Lifu at the time. Starting on the 20th August.

- 20th. Rain off and on all day. Clouds 60-100%. Fresh SE breeze.
- 21st. Dull cloudy & overcast, almost constant rain & showers. Clouds 100%. Strong ESE wind.
- 22nd. Cloudy & overcast, showers off & on all day, slowly fining. Clouds 100%. Strong ESE wind.
- 23rd. Dull cloudy, odd showers. Clouds 100%. Light northerly airs.
- 24th. Same as previous day but fewer showers.
- 25th. Dull, showers off & on, strong northerly falling to a calm, then heavy rain & thunder storms from 2 pm onwards. Clouds 100%.

- 26th. Strong N and NE wind, heavy rain off and on, light showers almost constant, later clearing slightly but settling into heavy rain and thunder storms from 4 pm onwards. Clouds 100%.
- 27th. Clear fine and sunny, light NW airs. Clouds 20%.
- 28th. Fine clear & sunny, clouds 10-20%. Light northerly airs.
- 29th. Calm, clear & sunny, light northerly airs, clouds 50%.
- 30th. Fine sun & cloud, light airs, clouds variable from 0-80%
- 31st. Fine, clear sunny, light SE breeze, cluds variable 10-80%.

September

- 1st. Clear sunny light SE breeze clouds 40-60%.
- 2nd. Fine clear sunny, calm. Clouds 10%.
- 3rd. Fine clear sunny. Light SE breeze. Clouds 20%
- 4th. Fine clear sunny. Cold southerly wind. Clouds 10-20%
- 5th. Fine clear sunny, light southerly wind, clouds 20%.
- 6th. Fine clear sunny, fresh SE breeze, clouds 20%
- 7th. Fine clear sunny, fresh SE breeze, clouds 60%.

At 4 P.M. wind died down, swinging to north through east and clouds increased to 100%.

Unfortunately I did not record the weather after this date but from what I can remember of it it was very similar to the northerly weather experienced earlier in these records. I remember I had to protect my cargo, the skins and camp gear with tarpaulins and ground sheets from showers which came when I was getting my gear aboard the small inter-island steamer when I was leaving Lifu a few days later.

From the above it would almost appear as if weather did play a large part in the movements of the birds.

Though it was not proven by actually collecting a specimen, and such would be more or less accidental unless one were resident on the island and also the presence of the local species complicates matters somewhat as regards collecting, I think from the evidence I collected on Mare and Lifu it is pretty certain the species passes through this way on its migrations to and from N.Z. and the Solomons. It seems the most reasonable route and New Cal. would present a fairly wide barrier across its path when passing either north or south and would increase its chances of finding land, even if blown off its course. Also the lay of that island is in such a position that if the birds were carried down wind in the direction away from the prevailing wind they would be almost sure to hit the island in the NW end, as it runs well down to leeward of the true course.

No. 17. Tyto alba lulu: (Peale)

This species is very abundant on the island and a series were collected. It is very noticeable that there is a great deal of variation in the different specimens in the amount of spotting underneath and some variation on the back. The natives recognize two species one a small very white kind and one a larger much stronger species not so white or pale in color. The difference they note is probably the difference in the sexes as females are larger and stronger than males, and have more marking on them. Even so there is such a wide variation in the birds seen on Lifu that tho' I do not think there has been some introduction by hurricanes from areas further and these have inter-bred with the local race and caused the wide variations to be found on the island at the present time. Natives have remarked that at times at very wide intervals they have seen

Tyto with almost rusty unders, these are undoubtedly T.a. interposita (Mayr) which have been carried down from the N.H. possibly at the same time as other birds have been carried to Lifu; proof of this I was unable to obtain as the owl is so common that natives could not remember whether the buffy undered ones seen were at times when other birds had appeared or a hurricane had occurred. The natives seemed certain that the buffy colour was not due to reddish soil on the feathers. The previous claim by Brasil of the lack of spots on the unders of the Lifu Tyto is nicely shown to be quite wrong in the series collected by me, apart from the specimen mentioned by Mayr in the A.M.N.228. There is little doubt that the Lifu bird is very similar to the Southern N.H. race, though it is not to the Northern N.H. It is possible that an accidental specimen of another Tyto was collected on Lifu as it has been shown that for some reason Lifu is in an area that strange birds seem to be carried to fairly frequently and one of the Australian race may have been carried there; but this must have been an isolated instance as this bird played a large part in native folk lore and the religious and dancing life of the natives and any other race being present would be known to the natives for a certainty, whereas they only speak of the white and small and the darker and stronger birds.

The natives on Lifu in the old days prized the feathers of this species for their dancing head-dresses and had a rather peculiar way of farming the birds. When a nest of the species was located they waited till the young were hatched and a few days old then they tied the nestlings feet around a large hard fruit which grows on a vine in the forest -- this fruit is not

unlike a potato to look at and is common all over the western Pacific -- and left the birds in the nest to be fed by the parents. The nestlings' feet became more or less useless and they could not leave the nest and could never hunt for their food. When the adult eventually abandoned the young long after the usual time of young leaving the nest the natives would continue to feed the young birds. If the birds did leave the nest they were unable to perch and quickly came to earth and were easily recaptured. When the full adult plumage had grown it is beautifully clean and unabraded and the feathers were plucked and made into head dresses for the local native dances. Sometimes the birds would be thus kept in captivity for two or more years but more often than not only one year's plumage was taken and the bird was destroyed. The natives were wise enough to generally only eventually keep the best young one in captivity and they would unbind the feet of the other nestlings and allow them to go away. Strangely they say the parent birds invariably let these released young take their chance and fend for themselves once they left the nest but the one remaining helpless one they continued to feed and it grew very rapidly and quickly developed into a large bird. From what the natives say I believe the male parent looked after the ones away from the nest and the female looked after the one that remained in the nest. Rarely both parents fed the youngster in the nest and always towards the end both parents would be seen feeding the young in the nest while the other young had been weaned and were fending for themselves entirely.

Natives on Lifu know of the long absence of Tyto, or rather not its absence but its silence and unobtrusiveness at certain seasons of the year, roughly at the non-breeding seasons. They say the full moon always brings it out but at non-breeding seasons it does not call and seems to be much more shy and retiring and not such a fierce hunter, keeping well away from areas occupied by humans. They seldom call when hunting at this season of the year and the natives used to say shortly after Tyto commenced calling a lot was the time to go and examine the nesting sights for the young birds.

Habits of the species seem quite normal on Lifu and it does not show any different habits to other barn owls.

As far as I could ascertain the bird lays 4 eggs, I saw one nest of young with this number of nestlings. Eggs are pure white. The species breeds early some laying in July and some few even earlier, all have finished breeding by September and the young are by then away from the nest. Incubation takes about 18 days as near as I could gather. The young leave the nest and perch in some tree and continue calling constantly all night and the parents return at intervals to feed them. It is seldom more than two are being fed at the end of the first week and at the end of the second it is almost invariably two or only one is being fed. This comes about by the bolder nestlings following after the adults and becoming separated from the others, these bolder ones generally intercept the returning parents and the constant calling attracts the parents which continue to feed the one bird and the others go hungry. There is a certain amount of community work goes on at this stage, I believe as parents do not seem to invariably feed their own young and a food laden bird passing

a noisy youngster will deliver up to the strange youngster. Thus some of the young which were not so bold may survive but the stronger and bolder ones probably cut in on them and again later. Also a weak bird constantly becoming weaker will give weaker and weaker calls and its chances of being heard become smaller and smaller. The young generally perch high in a bare tree or in a leafless banyan and if they see any thing fly anywhere near them they become excited and their cries become very pitiful and begging, even a flying fox passing will set them off on the begging call. At other times the call is regular and with more of a lost weak sound about it, uttered at regular intervals of from half to one minute sometimes at 1/4 minute intervals. On sighting any bird it becomes more of a murmuring and excited "give, give" call, and is more or less constant.

There is little doubt that the moon and the weather at the full of the moon controls the condition of this species, birds being fat if the weather is good at the full of the moon and they lose condition as the moon wanes. The fold of skin along the bare part of the abdomen appears to be the main place where the reserve store of fat is laid up to assist them through the leaner times of lack of light for good hunting. At the times when numbers of this species are found weak or dead about the country if records are kept it will be seen that nearly always there has been bad weather at the full of the moon for one to three times running and the species has slowly become weaker and weaker as time has passed. At such times it is not uncommon to find the species hunting in the daytime probably in sheer desperation of hunger. Also the species suffers from parasitic

worms which would aggravate the trouble and further weaken the bird, and they also suffer from blood sucking skin parasites.

On Lifu natives spoke of an affinity between snakes and owls in their nests but I could find no basis for claims. On Lifu Tyto generally nests in caves or holes in the coral cliffs or rocks and rarely in trees and it is possible snakes frequent the caves after bats or Collocalia or Erythrura all of which inhabit them also but I searched very carefully and found no evidence of snakes in caves. Not all natives thought there was any affinity and many frankly pooh-poohed the idea.

No. 18. Collocalia esculenta uropygialis: (Gray)

A common species on the island and identical in habits with the race in other parts of its range. What has been written of it on other Loyalty Is. is true for Lifu. It favours the more scrubby habitats and generally hunts closer to the ground than the other Collocalia on the island. I do not think it is as common as spodiopygia on Lifu and from what locals say during the hot months it numbers only about one to ten of the larger species. During my stay though it varied in different areas in numbers and was much the commonest in forest areas the total numbers of it would not have been more than about one to two of the larger species.

Nesting and other habits are identical with elsewhere. One egg only being laid.

Mayr's Query: Nest:- In caves, under the branches of big trees?

Answer: Yes, on Lifu in both places. Actually it does not favour nesting in caves so much as in places where there are overhangs of rock and so on, more like the entrance to

caves or in under ledges or the shallow caves in coral faces, amongst banyan tree roots very common, and on the under side of branches, providing rain water drainage does not make the spot unsuitable.

No. 19. Collocalia spodiopygia leucopygia: (Wallace)

Very common and plentiful on Lifu. Its numbers definitely increases with the rains and decrease in the dry times. Numbers of the birds, probably the adults move elsewhere at the times, they may move down to New Cal. as in much of that areas there are no suitable breeding sites, yet the bird is common all over the area. See the notes on this species on Uvea and what is said for the bird on that island applies equally well for Lifu, in fact some of the data there is from Lifu.

The bird was common along roads and anywhere in grass patches or village greens and hawks much above the tree top level over forests. It is a higher flying species than the smaller species. On Lifu it seems to find a good hunting ground over the Cadjan or Pidgeon Pea, probably feeds on the insects attracted to the flowers of that shrub. Another fact I noticed on Lifu was that where a ripe paw-paw or more than one had fallen on the ground and made rather a mess on which little fruit flies were feeding one would see C. flying backwards and forwards through the little crowd of flies above the fruit. Often two birds would do this the second following close on the heels of the first and apparently feeding on the flies stirred up by the passing of the first bird. The birds would then bank round and return through the place again.

No. 20. Halcyon chloria canacorum: (Brasil)

This species is common over much of the island but appears to favour more open types of habitat and is not common in true forest but as the types of habitat of Lifu are exceedingly mixed it is generally to be found along the margins of true forests in all parts of the islands. It is exceedingly common about native gardens and villages and often attacks domestic chickens at the breeding season in the latter habitat. It appears identical in habits with the other Loyalty Is. birds. Breeds in hollow limbs or in the stump of a blown down and rotten coconut palm. It does not nest in the ground in burrows to the best of my knowledge but it will dig a nest burrow for itself in a rotted tree. It sometimes, but rarely, nests in a small cavity in a coral rock cliff face. Eggs up to 4 and sometimes more, pure white and round as usual in this species. Breeding season is long drawn out and often more than one brood a season is reared. From July to Feb. eggs or young may be found but the majority of birds lay from Nov. to early Jan.

Mayr's Query:- Habitat. - Near the beach (?), forest, native gardens (?)

Answer:- Beach, yest commonly on Lifu and right out on to the reef between high and low water margins. Forest, not to any extent on Lifu, in fact it is seldom seen in true deep forest, though it is common in the borders of such habitat. Native gardens, yes on Lifu to a very large extent, one of its favourite haunts on that island.

No. 21. Lalage leucopyga simillima: (Sarasin)

A very common species all over the island and seems to

be at home in every type of habitat except extreme seashore or beach. It feeds at all levels from the ground up to the top of the highest trees and probably spends 70% of its time in and about the upper leaf canopy but in native gardens especially it will often be seen feeding almost on the ground level. It appears identical in habits to the birds of this species on all the other islands of the Loyalties. Its calls are identical and there seems little difference between the Loyalty race and the New Heb. race to an observer in the field. Its breeding habits are possibly identical but I found none breeding on Lifu during my stay though they breed more or less all the year round or rather odd ones do but the main breeding season is from Nov. to Jan. Eggs two and the same as the specimens taken on Mare Is. from native description.

This species must be of considerable value to agriculture as it destroys innumerable caterpillars and insects.

Mayr's Query:- Habitat. - Forest (?) A Yes to a large degree but it is just as common in other types of habitat all over the island, even to open grasslands with some low bushes or shrub.

M.Q. Food. - Caterpillars, small fruit (?). A Yes, the fruit is generally that of the banyan. See my remarks on the species on Uvea.

No. 22. Coracina caledonica lifuensis: (Tristram)

This species is very plentiful in parts of the island where coconut areas are extensive and is common in most parts of the island. It appears more akin to the Coracina of Erromanga in habits than to the bird of the northern New Heb.

as it seems to prefer the more open types of habitat to the forest. Its call and flight are typical of the other dark shrikes of the race and it seems in every way to be the same as regards nesting and breeding etc. to the bird on Erromanga. The breeding season seems to be from about Aug. to Jan. and odd birds may breed outside these months. Two eggs are laid in a typical small cobwebby shrike's nest with slightly more vegetable matter incorporated than usual for shrikes.

This species is one of the most valuable species on the island from the point of view of native agriculture as it is responsible for the complete extermination of the leaf eating locust which is present on Mare Is. and which cuts the copra production of that island down to about 1/4 of what it should be. Had the administration of New Cal. introduced this bird to Mare instead of the New Cal. crow (Corvus moneduloides) the position of the bird life of Mare would be very much better than it is today and this coconut insect pest would be completely eradicated. This insect was introduced to Lifu also and was rapidly spreading and had actually almost ruined the coconut production of one area. For some time Coracina did not look on the insect as food and did not attack it. Later it began to attack it and cleaned up the island in quick time till today it is impossible to find a single one of the insects even in the area where they were wiping out the copra production. The Coracinas were systematically attacking the pest and some natives said that in two months there was not a single one of the insects left. This species spends much of its time in and about coconuts and must do an untold amount of good for this crop in keeping the

numerous insects which attack the palms in check. It is a valuable bird and does not attack other birds as does the crow. It will dig into rotting wood of palms and trees after the beetles and grubs which inhabit such situations and its powerful beak is a good weapon for this kind of work.

It is of interest to record that the island of Tiga between Mare and Lifu belongs to the natives of Lifu and some of them live there and many of them own coconuts on that island, but because of the insect pest on the island the copra production is nearly nil. The natives of their own initiative went to Mare and captured some of the crows and returned to Tiga and released them. Not a single one remained on the island all returning to Mare. There is no forest on Tiga only low scrub and coconuts and the birds did not relish this entirely unsuitable habitat. Had Coracina been introduced I have no doubt it would have stayed as it inhabits exactly similar habitat on Lifu during fully 40% of its time. It probably inhabits coconuts and native garden lands during fully 70% of its time and spends perhaps another 20% of its time in the margins of forests and the remaining 10% of its time in the forests themselves.

The natives of Lifu are to make an attempt to capture some of this species and transport them to Tiga some time in the near future.

Mayr's Query:- Food. - Caterpillars, other insects (?), locusts.

Answer:- Yes many other kinds of insects, in fact on Lifu beetles must today form fully 60 or 70% of their food. Amongst these is included the Rhinoceros beetle which is so detrimental to coconuts, this being a further service this valuable bird renders to agriculture.

Note:- You give as habitat for this species "Forest". This is not correct for either the Lifu or Erromanga race though it is for the Northern New Heb. race. More open forest or park lands and coconut groves is the habitat of these two races. Even grass-lands would be more correct for the species than forest as they spend much time in such habitat in both islands.

No. 23. Turdus poliocephalus pritzbueri: (Layard)

SEE ALSO NOTES UNDER GEN. SUMM.

This species is I believe already entirely extinct and without any doubt is in a position from which it cannot recover without a miracle. The local chiefs of the island hold monthly meetings and through them I organised an island wide search for the bird and not a single report of the presence of the bird was obtained, nor could I obtain a single record of the presence of the bird within the last few years. On Mare I have no doubt the crow has played a not inconsiderable part in the decrease of the species but there must be some factor common to both islands which is responsible for the extermination of the species on both islands and it seems to observer that this must be sought for in the food on both islands. Mare is. Turdus may win back with exceptional luck but Lifu cannot possibly in this observer's opinion. I have had two records of the Mare Turdus having been seen since I left that island about a year ago, but both these records were from the one area and may be the same pair of birds. Lifu has had no sight records in a number of years. The Lifu Turdus unlike the Mare race was not a shy bird and was exceedingly friendly towards humans and would be far more likely to be seen than its relative on Mare. Natives

say when they commenced to clear the area for a new garden Turdus invariably turned up, and when they would arrive on the site next morning T. would be absent but immediately they commenced using an axe T. would call and arrive there and begin searching for food in the new ground exposed or amongst the rubbish on the ground. There is little doubt this race is done if it is not already completely gone and extinct.

No. 24. Rhipidura spilodera verreauxi: (Marie)

This species is exceedingly common all over the island and is a typical Rhipidura in habits feeding mostly close to the ground but occasionally going higher, though on Lifu this is rare and one might almost say it is a bird that lives from the ground up to 10 and occasionally 15 ft. from the ground. At times natives say it goes high into banyan trees in fruit but I saw no instances of this myself. It appears to relish the Cadjan scrubs abundant in the native scrubs. I saw no eggs of the species but natives say they lay two eggs and the breeding season is from Nov. to Jan. The nest is typical R. with no tail and is inclined to be larger and bulkier, though it is flatter and the cup is shallower than usual for R. The bird is not a very good songster though it has a pleasing enough song it does not use it a great deal and has a number of rather harsh notes in it and is liable to break down in the middle of the twittering calls it uses. It is a bold bird with a rather upright carriage and looks exceedingly handsome in the field. It is easily lured by squeaking noises or by placing the finger on the lips and sucking inwards. Natives lure it by blowing on the thin edge of a leaf held to the lips and it becomes very

excited and pugnacious when these calls are long continued.

It is not exactly a friendly bird though it will come to calls but if no calls are given it will move away from the observer. It suffers some persecution from native youths but this is not sufficiently serious to affect the numbers of the bird.

It ranges wide and is found in every type of habitat on the island except extreme beach habitat, though where vegetation is found right to the water's edge it is to be found even there. It is common on grasslands where there are any small bushes or shrubs or isolated trees and is to be found in the densest forests or the densest scrubs and in garden lands. It does not suffer from hawks and I have seen it swooping at an Accipiter which was tearing its kill on the ground and which I was trying to stalk.

No. 25. Rhipidura fuliginosa bulgeri: (Layard)

This species should be struck off the list of birds of the Loyalties as it is not present though it may have occurred there once or twice by accident. This observer believes if any species of plain breasted fly-catcher did occur accidentally there and was seen it would have been one of the New Heb. races and not the nearer race from N.C. The natives know of no other kind of R. than that which is common to the island and was collected by me.

No. 26. Myiagra caledonica viridinitens: (Gray)

This species is not exceedingly common on the island but is by no means rare. It is found in every type of habitat on the island though generally speaking it is not very common in

the more open types of areas. In this observer's opinion there are grave doubts as to whether this race should stand as the amount of white in the tail varies to such an enormous degree that it would be impossible to treat it unless a large series is available for examination or a wrong impression might very easily be obtained of the race. I believe the amount of white in the tail is more an age distinction than anything else, birds of several seasons' breeding having more white than birds in first year's breeding. I certainly very much doubt the validity of Sarasin's sub-spec. for Uvea, as from what I could see in the field both races seemed the same. One could select a series on Lifu with little white in the tail and another from Uvea with much white in the tail but it would be possible to completely reverse that difference and by selecting the other way have a series of Lifu birds with more white in the tail. As regards the habits, breeding, nests, eggs, calls and in every other way the races on Lifu and Uvea are identical.

Breeding is the same as Uvea and reference to that island will give an exact picture of the race on Lifu except that the bird is much more common on Lifu than it is on Uvea.

No. 27. Gerygone flavolateralis lifuensis:- (Sarasin)

Except that one gains the impression that the Uvea is. bird is the largest of this race in the Loyalties, the Mare next and the Lifu the smallest of the birds, all the Gerygones of the Loyalties appear more or less the same except perhaps for the amount of white in the tail and that is not at all noticeable in the field. As regards habits and song the birds

appear the same apart from the fact that the song of the bird on the different islands varies in volume according to size of the bird, or rather one should say weight, as there is little difference in the wings, sex ratios seem to point to males being more common but this is because the females keep further away and this was proved on Lifu by shooting the bird of a pair which was at the furthest distance from the observer. All the notes of the species on Uvea apply equally well for the bird on Lifu except that the race on Lifu revels in the two introduced types of scrub on the latter island. The bird is exceedingly valuable to agriculture and must do an enormous amount of good. The population of this species on Lifu except in the two introduced types of scrubs appears to be slightly below that of Uvea per acre but close investigation shows that this is not so and that the population per acre in Uvea forest is almost identical with the population over the greater part of Lifu and only in the lower forest margins of Uvea is the population greater than on the larger island. In the ti tree types of scrub on the volcanic soil of Lifu, where garden culture is intensive, the population of Gerygone is easily as great as any found on Uvea. It is noticeable that the number of imm. with yellow eyebrows is very high in these areas, much as is the case on Mare Is. Evidently the denser population and suitable nesting sites are responsible for this. As regards the forest the bird is identical with Uvea in all ways and in behaviour.

Breeding and all other habits seem the same on all islands. It will be interesting to see just how the three sub-spec. claimed for the Loyalties pan out. There is a weight difference but in the field that is the only really noticeable difference as the song volume goes with the weight and is to be expected.

No. 28. Pachycephala pectoralis littayei: (Layard)

SEE NOTES IN GEN. SUMM.

This species appears identical in habits with the species on Uvea and reference to the species and notes thereon for that island apply equally well for Lifu except that the expanding and contracting or wave or tide like movement of the species on that island is not apparent on Lifu. Also the race on Lifu seems to be more nomadic, birds appearing to move about from place to place within a district a great deal.

No. 29. Artamus leucorhynchus melaleucus: (Wagler)

Is a very common species all over the island especially in the more open types of areas such as grass-lands etc. In habits and behaviour it seems identical here with other places in its range. It is not as common on Lifu as it is on Mare but it is still a very common species. It nests on Lifu as on Mare on the tops of snapped off palms and such like places. It must be of considerable value to agriculture in the amount of insect life it destroys. It takes the place of the higher flying swifts and devours the larger types of insects which the swifts do not tackle.

No. 30. Aplonis striata atronitens: (Sarasin)

A very common species on Lifu and on that island its habits and behaviour and life seem identical with all the other islands of the Loyalties. On Lifu it feeds much on the forest snail as it does on all the other islands and may be heard breaking the shells of these on a rock or stump often in forests. Unlike Turdus which extracts the snail by tapping it without breaking the shell Aplonis smashes the shell to pieces. As on

More a common nesting site on Lifu is a hole excavated by the bird in the side of a standing stump of a beheaded coconut palm. I have watched the bird commence its excavation and its strong bill makes light work of the rotten coconut stump fibres. The dead palm stump has to be old and pretty rotten before they will tackle it. The species invariably nests in a hollow of some sort, in the limb of a tree, in the trunk or in a palm as previously mentioned. Breeding season, number of eggs and so on are the same for all the Loyalty group, and the breeding season is a long one.

This species suffers from Accipiter to a large extent as it often perches on the ground in open or semi-open places or in the forests and offers a good chance for A. to make its kill. Doubtless its habit of breaking snails which can be heard at some distance and its preoccupation when at that job offer a sure guide and a fine opportunity to A. when it is hunting through the forests.

It also suffers to a great degree from native persecution by being one of the commonest and most often caught species in their snares. It is sufficiently large a bird to offer a fair meal to natives who are very fond of its flesh. It is very fond of paw-paw and that is the commonest bait used in the snare and the results is that numbers are caught and are eaten. It feeds at all levels. It occasionally gathers in large flocks at the non-breeding season probably for mating or selection, or to feed on some especial banyan or some such tree in fruit.

No. 31. Philemon lessoni: (Gray)

This species is common on Lifu especially in the forests but is not so common in the lower or more open types of scrubs.

It is an exceedingly noisy species in the breeding season on Mare but on Lifu it did not appear to be nearly so noisy. In fact in the real forests, though it was present in very great numbers, it was seldom heard. In the field this observer gained the impression that the bird on Lifu was not as large as it is on Mare Is. In other ways it seems identical with the birds of Mare and other Aust. leatherheads in general. It is easily lured to the observer by squeaking calls. It does not suffer to any great extent from native persecution but the French residents and visiting shooters from ships look on it as fair game and are rather fond of it for eating saying it is a very sweet morsel for the pot. This species will attack and drive away marauding cats and can give a cat hell and considerably more than it is game to face. The excited calls of a pair attacking a cat quickly gather a large number of the birds from every direction and apart from pussies hunting in that area being spoilt they, when there are enough of them, swoop and actually strike the cat, and I have seen a cat knocked off his feet by a couple of birds striking him at the same time. Before a crowd gather they will not come within striking distance of the cat but swoop close above it. When there are a number several swoop almost together and give the cat half a dozen blows from different directions at almost the same instant. No cat appears game to face them and the birds will follow the cat as long as he remains in the forest and the swearing they indulge in can be heard at a distance, and other birds joint in heartily. Pussie's remarks are inaudible but must be pretty vivid.

No. 32. Lichmera incana incana: (Latham)

All the notes on this species on Uvea apply equally well to Lifu. It is a species which seems to be controlled in its

distribution by the coconut palm and is never found far from the coconut anywhere but is always present if coconuts are present. Its breeding and nesting habits are the same on Lifu as they are on Uvea and the distribution of the sexes are the same. The ratio of females to males on Lifu is much above what is usual in this species and males probably do not outnumber females by more than about three to one. As elsewhere it is an exceedingly noisy species and one of the first to call in the morning. All that was said of the species on Uvea will be found to be exactly the same for Lifu.

Mayr's Query:- Habitat. - Forest (?). A. No, unless coconuts are present. Where coconuts are there L. is. They only are found a very short distance into forests. M.Q.:- Food.- Insects and nectar (?). A.:- Both in about the ratio given for Uvea. These honey eaters always vomit any honey they have in the stomach when they are shot but its presence can be told by tasting the contents of the stomach with the tip of the tongue. A fact I noticed on Lifu was that the bird there appears to feed on more ants than elsewhere as the presence and smell of formic acid was much more noticeable than on other islands. In fact on Lifu it was the exception to find a bird stomach without any trace of ants. This may have been something to do with the season at which I was there, and on other islands it may have been the same at this time because of food shortage and flowers.

No. 33. Myzomela cardinalis lifuensis: (Layard)

This species is very common but is easily overlooked as it is not noticed very much because it feeds generally very high up in the forests. It does not appear to leave the forest habitat and is seldom seen outside that habitat, and never at any great

distance from it. The bird is just as common on Lifu as it is on Uvea but one would not think so at first glance as it spends at least 80% of its time at heights of from 60 ft. above the ground and upwards and is often barely visible in the tree tops. It will come down to lower levels if called and it is amazing to see none about, give a few calls, and find three or four about one in no time. Females do not seem to go as high nor spend as much time high up as do the males. The sex ratio seems to be the same as elsewhere, about one female to ten males, but one does not get that impression at first as one sees more females at lower levels and the sexes seem to be about three females to two males till one calls the males from the great heights. In habits the Lifu bird seems identical with the Uvea race but the song of the Lifu bird is decidedly weaker than that of the Uvea bird though the notes and tune seem the same. One also gains an impression that the Lifu bird is slightly smaller than the Uvea bird. Breeding and nesting habits on the two islands appear to be the same. There is no tide-like movement of birds on Lifu as there is on Uvea. On Mare the little I saw of the bird there seemed to point to its habits being the same as the other islands but it was so rare on that island that little of its habits could be recorded. On Lifu it is definitely a bird of the upper leaf canopy and spends its time up there feeding on blossoms and insects. If the bird had a stronger voice its early morning song would make a very fine chorus as with the first streaks of sunlight the males perch very high on a bare or prominent twig and sing lustily for five minutes or more, and others within 30 ft.

or so do likewise. The song is only faintly audible on the ground 100 ft. or so below and only two or three birds can be heard at the same time. As elsewhere it is an exceedingly pugnacious bird and will interrupt its song to dive at a bird singing near by. It will attack and drive away birds several times larger than itself and often drives Lalage away from trees in which it feeds. It is definitely a bird of territory and lays claim to an area or to certain trees and will drive any intruders away, either of its own or other species. It wages constant and bitter warfare with Lichmera in places where their habitats coincide. In the open Lichmera seems the bolder and drives M. away but in forest the position becomes reversed and L. loses its courage and M. becomes a little raging fury and drives the larger bird helter skelter and makes constant and vigorous attacks till it clears out. I have also seen it swoop at but be careful not to come within too close range of an Accipiter perched motionless in a tree waiting its chance to strike at some prey lower down. Apparently the attacks of M. so annoyed the hawk or they spoilt the hawk's chance of making an unexpected attack the hawk moved on very soon. As usual after any such victory the bird mounted to a tree top and told the world what a grand chap he was even though his voice was somewhat weak.

Its food on the island is the same as elsewhere. On shooting, nectar is vomited out of the stomach but can be traced by tasting.

No. 34. Zosterops minuta: (Layard)

This species is exceedingly common on the island.

SEE ALSO NOTES IN GEN. SUMM.

No. 35. Zosterops lateralis melanops:

This species is common in the more open types of habitat and appears to thrive in the introduced Cadjan shrub areas.

SEE ALSO NOTES IN GEN. SUMM.

No. 36. Zosterops inornata: (Layard)

This species is very common all over the island in the particular habitat they favour which is a well covered habitat or early and late native gardens to feed on fruit, but even in these more open types of habitat it keeps under cover and will not venture out into really open places.

The bird has only two calls and neither of them are in any way like Pachycephala. Layard like myself to begin with must have mistaken calls of true Paghy present thereabouts for the calls of this species.

Nor does the species live high in the trees. Layard possibly had his specimens brought to him by natives who said the bird was shot high in the trees, but 20 ft. to the native means exceedingly high, as more often than not a bird beyond that distance is considered out of range to him. They are a bird of the lower levels definitely.

SEE ALSO NOTES IN GEN. SUMM.

No. 37. Erythrura trichroa cyaneifrons: (Layard)

This species is very very common all over the island and is much more plentiful on Lifu than it is on Mare. The mixed type of country on Lifu seems to suit the bird admirably and nesting sites are abundant and the birds breed in every part of the island.

It is an exceedingly early riser and birds are on the

move while it is still dark and only the first faint streaks of dawn are to be seen in the east. It is a late rooster and may be seen arriving in a dark foliaged tree at the last moment of dusk. In the middle of the day it does not move about at all, evidently retiring to the forest and resting if not actually sleeping. On Lifu its nesting habits are the same as elsewhere. Nests are sometimes in caves or in holes on cliff faces but on Lifu they are more commonly found just on the ground between two large stones in the forest or in a hole in the coral rock in one of the numerous coral dykes or ridges so common all over the island. It is the presence of the large numbers of this ground nesting species on the island that makes me rather discredit the presence of cats having been responsible for the decrease of certain species as, if the cats were so numerous that they could reduce the numbers of other species, there would be none of this species breeding on the island as the cats would have found their nests and young exceedingly easy prey. As regards the breeding and nesting habits, except that on Lifu the bird breeds in more open places and not so much in caves as on Mare, all written about that species on Mare applies equally well to Lifu. Where caves or cliffs are available the species uses them but it is noticeable that often in such areas many birds for some unknown reason seem to prefer to place the nest between two stones on the ground though there are still plenty of cliff or cave sites available. It is noticeable that the birds invariably place their nest in some position where a down sloping flight in some direction with the first three feet of flight somewhat covered or sheltered by ferns or a cliff ledge may be found so that the bird has full or at least

fast speed by the time it is in the open and thus subject to attack from hawks or other birds. It is noticeable that the birds invariably leave the nest by this fast route. The same was true of the species on Mare though I did not notice it there as they nest there in collapsed caves and the thing that drew my attention to it on Lifu was actually necessary to reach the nest on Mare. This was that when returning to the nest the bird flies high above the nest. Even as high as 20 ft. above the nest as if it was going to pass the nest and suddenly closing its wings it dives almost straight down into the nest at a terrific speed. It almost seems as if the bird fears slow flight and will only fly slowly if it is well under cover. This fast return to the nest is also a good way of hiding its situation as it is so sudden the drop that more often than not the bird completely disappears from the sight against the green background of vegetation. When leaving the nest, though there are other ways in the open they can use, they never do use them but leave by the covered way. This is often very scanty, merely a few fern fronds or some such but they would be sufficient to baffle a bird of prey. It is very noticeable that the nest platform where the bird necessarily has to be still is always well protected.

This is, in this observer's opinion, another species which has been brought to the Loyalties from the New Heb. by hurricanes and has established itself on Lifu. It may have been brought to Mare at the same time but in the observer's opinion it has spread to Mare from Lifu, though it seems hard to account for its not having gone down wind to Uvea also. It is just possible the small islands between Lifu and Mare have formed a bridge for the species to cross whereas the water distance between the other two islands has turned the species back. It is

worth recording that Layard makes no mention of the species on Mare and to the best of my knowledge Sarasin did not mention it. The area on Mare where it is most plentiful is in the north and in the south, though present, it is not really plentiful and may be just establishing itself there. A glance at a map shows that the islands between Mare and Lifu would lead a bird using them as a bridge into the NW and N of Mare Is.

The finch is present but is not at all plentiful, is in fact rare, on Tiga Is. according to native accounts and one old man said it had not always been present in that island and in his youth was unknown there. Unfortunately, I did not make any inquiries along these lines on Mare though I got the impression from the natives that the species had always been present on the island. By the evenness of the distribution and the fact that a point of about the limit of population has been reached on Lifu I should say that island has had the bird a great deal longer present than Mare Is. has.

The species suffers somewhat from the live bird fanciers of Noumea and unfortunately the white residents of the island have no idea of keeping birds in captivity and the mortality is well over 90%. In three cases I was able to check up on, the following were the results. All were in the one breeding season. One catcher, 8 adult captures all died within four days. 42 nestlings, all but three dead within three weeks and only one survived till it reached Noumea. Second catcher, 11 adult captures, two survived to Noumea. 68 nestlings, none survived to Noumea. Third catcher, 15 ad. captures, one survived to Noumea. 82 nestlings, none survived to Noumea. Fortunately

the trouble they went to and the small return has somewhat damped their ardour and nowadays they only try their hand at odd ones and so far results have not improved much if any, but pressure and urging from Noumea are constant and they are bound to keep the persecution up. Many Noumea aviculturists send traps and cages and bird seed to local residents constantly asking them to make captures and forward them to Noumea.

The present status of the species is in no danger on Lifu but if the live bird capturing is allowed to grow unchecked there will be a different tale to tell.

The introduction of the Cadjan seems to have suited this species and one can nearly always find the species in the early morning in any area of Cadjan. Strangely it does not feed on the Cadjan itself but feeds on the grass seeds etc. on the ground under the shrub. This is possibly because such places protect them from attack from hawks etc. yet supply them with plenty of feed. They may eat the dry seeds or peas of the Cadjan which fall to the ground but I found no evidence that they did and I should imagine the pea was rather large for this bird to tackle.

No. 38. Circus approximans wolfi: (Gurney)

A common species in certain areas of the islands where there are grass patches of any size. The population of this species for the whole island is probably not very large but it is often seen as it ranges very widely. It breeds on the island but I had no opportunity to study the habits of the bird. One specimen in the white phase was collected, and several others in the brown phase were seen. On Lifu the bird is unusually fierce for this species and much bolder than usual.

It will attack and kill well grown young goats in a part in the north where goats are grazed and it is hereabouts that the bird is most common.

No. 39. Falco peregrinus ernesti: (Sharpe)

This species is fairly common about the cliffs of the coast where it breeds, but it seldom or never hunts over the island or the interior of the island. It seems to confine all its hunting to sea birds and goes some distance out to sea to make captures. It feeds much on the sea birds which come in to roost on the faces of the cliffs and on the racks about the coastline of the island. Any times I observed it flying inland or in the centre of the island it was flying high and first for the other or nearest coast. Natives say it very very rarely attacks poultry and they have never seen it do so except right on the coast, and have never seen it make a kill inland. It is not often seen within gun shot except along the coast where inaccessible cliffs make the retrieving of shot specimens a matter of doubt. It is often to be seen playing on the updrafts of wind from the cliff faces of the coast in all places on the island depending on the direction of the wind. As far as I could see the birds on Lifu appeared identical with elsewhere.

No. 40. Pandion haliaetus cristatus: (Vieillot)

This species visits the cliffs of the southern part of the island at very rare intervals but does not stay long. There is one record of a pair nesting in the south of the island for a number of years in succession but they were either shot or selected some other nesting site. At the present time it can only be considered a casual visitor to Lifu.

Tyto novaehollandiae subspecies

This specimen reported from Lifu in an old French collection may have been collected on Lifu by accident, a stray brought from the Australian coast by strong westerly winds as Lifu seems to be in a pocked to which strangers are carried. It is certain that there is no definite novaehollandiae on the island at present though the larger stronger females might give one an impression of a different race with a tendency towards heavier spotting unders.

No. 41. Urodynamis taitensis: (Sparrman)

This species occurs on Lifu but is not well known there. It certainly does not breed there at the present time though some old men say it once bred on the island. I saw feathers of this species in several places on the island and they are greatly prized by the natives for hair pompoms for dances. They say some years it does not appear at all and other years quite a number are seen. Very strangely I could not find records of its occurrence on Mare. The east coast of Lifu seems to be where it occurs mostly, its appearance on the west coast being exceptional.

One very old native told me he had once found a young one of this species in the nest of a *Turdus* and seemed positive about his statements. He was reliable in other matters and I am inclined to believe him in this matter also.

None have appeared on the island the year previous to my visit but after leaving the island on Oct. 2nd, a native of Wei on the east coast is said to have shot one. This information was told me by a native of the crew of one of the cutters which run to Noumea when I saw him in Noumea early in October '38.

No. 42. Hirunda tahitica subfusca: (Gould)

This species is present on the island but is nowhere very common except in the SE corner of the island where there was once a small tidal lagoon. It is seldom seen inland anywhere except in the small volcanic area in the south where there are a large number of the species present. It nests in hollow trees in caves and ledges along the cliff faces of the coast. The bird seems identical with those on the other Loyalty Is. Its habits and breeding being the same on all islands.

SEA BIRDS OF LIFU IS.

Lifu is singularly lacking in sea birds and there are, as far as I could make out, only two species which ever nest on the island these being a few Anous which nest on the cliffs in certain spots, and a very occasional Sterna sumatrana.

Numbers of sea birds use the cliffs and the rocks of the fore-shore at the foot of the cliffs as a roosting place for the night. Sterna bergii and a very rare Sterna sumatrana and an occasional Anous. Just after dark numbers of birds may be seen and heard arriving to roost on the cliffs but the greater part of these seemed to be Anous with an odd other species of tern and a few Boobies. Nothing previously unrecorded from the Loyalties by me was seen by me on or about Lifu and, generally speaking, there are few sea birds near that island. There are no petrels nesting on the island, the soil being quite unsuitable and too shallow for these birds.

It is possible that both species of Noddies nest on the island but in my opinion there is only the larger and commonest species that nests though minuta roosts on the cliffs of the island for the night.

Petrels are common flying across the waters to the south of Lifu but these all nest on the mainland of New Caledonia.

On the 16, Sept. '38 on my way to Noumea I noticed great numbers of petrels off the SE corner of New Cal. (Yate and Goro). I was able to note 4 different kinds, in order of size from large to small I saw P. pacificus, P. lherminiera nugax, another black and white petrel about the same size as that species which I could not identify, and the small storm petrel Fregatta albobularis. On the 3-5th Oct. a local resident reported that he saw a constant stream of dark petrels passing from NW to SE along that side of the island about four miles off shore (New Caledonia mainland). On investigation I established that these birds were seen passing off the following points of the NE side of the island at about that time, Tao, Canala, Thio, and Goro, the latter place being where my informant saw them from.

BRIEF NOTES ON THE MAMMALS OF LIFU IS. IN THE LOYALTY GROUP, W. PACIFIC

There appear to be only the following mammals on Lifu other than European domestic stock such as cattle, horses, goats, donkeys, dogs, cats, and pigs, which all have been introduced, some having gone wild.

1. A native wild pig similar to the wild pig of elsewhere in the Pacific.
2. Two species of rat, one being indigenous and the other being the common grey ship's rat which has come ashore from ships wrecked on the coast of the island.
3. A bush mouse indigenous to the island.
4. Two species of large fruit bat, one has long been on the island, the other is only a recent arrival but is now well established.
5. One or more species of insectivorous bats.

Dealing with these individually the following are the brief notes which I collected on the different species during my stay on the island.

1. NATIVE WILD PIG This beast seems identical to all the other wild pigs I know in the Western Pacific, a real razor back and inclined to be as savage as hell if cornered or suffering from liver. It appears to have been on the island from time immemorial but has doubtless interbred with introduced pigs gone wild and today probably shows traces of half a dozen breeds. It is exceedingly plentiful on the island and does a great deal of damage to native gardens. It is constantly being hunted by the natives who capture considerable numbers annually which is just as well as the island would soon be overrun else.

2. INTRODUCED SHIP'S RAT This rodent has come ashore from wrecked steamers or sailing ships but so far has not spread far from the coast and appears to still be remaining about European dwellings and copra store houses and trading stations. So far its numbers are not large and it does little or no damage to coconuts etc.

NATIVE RAT This rodent is plentiful all over most of the island but seems to be unable to compete with the introduced rat as in places where the introduced rat is found the native rat disappears. The native rat lives mostly on copra and the meat of the coconut, native garden products such as yam, sweet potato, bananas etc. It breeds in holes in the rocks in burrows in the ground in the hollow limbs of trees and so on. Number of young and period of gestation is not known to this observer. Breeding apparently goes on all the year round but the main season of breeding seems to be from Sept.-Jan. (?doubts). The rodent

is mostly nocturnal but does feed to a large extent in the day and begins moving well before dark.

3. MOUSE This mouse does not appear to frequent European dwellings at all and only frequents native dwellings when they are deserted. It seems to be disappearing on the island, not being as plentiful as it was; but it is by no means uncommon at the present time. It appears to live entirely on vegetable foods and the excrement of animals and humans. It breeds in curved holes in the ground, generally in or under a clump of broad leaved bird's nest coral rock fern. The burrows vary in length from two to five feet but the majority of them are about three feet in length. These burrows are never straight but generally curve around so that the site of the nest is generally very close to the entrance of the burrow. The burrow itself generally goes quickly to a depth of several inches but where the nest site or chamber itself is, the soil is never more than an inch under the surface. This is doubtless so the mouse can escape from the burrow if a snake commences coming down the burrow after the tenant. If one is digging out these burrows they have to be constantly on guard to catch the occupant as they will suddenly burst the ground upwards above the nest and often jump nearly a foot clear off the ground as they come out and will escape. The only apparent necessity for the nest site is dryness and unlikelihood to flooding at the times of heavy rain. Breeding apparently goes on all the year round but the greatest number breed from Nov.-Jan. Four seems to be the usual number of young though natives say six is fairly common.

The mouse lives a great deal in heaps of dry coconut leaves and rubbish about native coconut plantations. It is very fond of

the soft sponge like heart of the coconut which has just sprouted and when natives are cutting the nuts open to make copra there is always plenty of this about. If natives have been cutting copra in one of their groves it is always worth while pulling a few heaps of rubbish to pieces as there are generally a few mice about them. They are not a very active species in the day and seem to be rather blind and bewildered in daylight. They are apparently a purely nocturnal species. Natives do not know of them climbing coconut palms and do not complain of them doing any damage as they are evidently a harmless type of rodent. Snakes and owls and to a less degree hawks are their natural enemies which take the greatest toll of them. The domestic cat which has gone wild on the island in considerable numbers doubtless destroys a large number of them at the present time, but the numbers which are still present where cats are plentiful seems to point to the attacks of cats not counting to any degree.

4. LARGE FRUIT BATS: (2 species)

SMALLER REDDISH BROWN OR GINGERY SPECIES. This species the natives say has always been present on Lifu and is today fairly common and plentiful. It seems to feed mostly on the fruits of the banyan and is generally to be found where banyans are in fruit. Its breeding habits are the same as most of this species elsewhere in this portion of the Pacific. The native name for the species is "THELA" or "THEELA". It is never seen in clouds as it is on more fertile islands, and compared to the New Heb. one would say that it is not common on Lifu. It is actually I believe, as plentiful as the food supplies on the island warrant. Natives persecute it to a limited degree but are not a serious menace to it in any way.

LARGER BLACK FRUIT BAT This species is a comparatively recent arrival on the island, it having made its first appearance about 25 years ago. The natives call it the same name as the other species but add the name in the language for a stranger or foreigner. They say this flying fox has a different smell and say it smells of some country. They have no idea where it came from. It appears to be a hardier species than the native variety and is slowly ousting the other. For long it was not common at all but today it is as common if not more common than the native species. It feeds on the fruits of the banyan also but seems to feed to a much greater extent on the fruits of other trees than does the native variety. It is thus more able to survive food shortages than the native species and on an island like Lifu, which is subject to severe droughts, that is a matter of some consequence. This species also appears to eat paw-paw, a thing the local kind seem not to eat at all. Both species set out to the feeding grounds before dark, but it appears as if the native species will camp in small mobs in a suitable tree near where it has spent the night feeding, evidently it does not have permanent camps; whereas the foreign species appears to have permanent camps and goes to and from them each night and morning. It is possible that this species has been brought down by cyclones from the New Hebrides and a comparison with specimens from there might be of interest. Once in 1929 when in a steamer about 100 west of Tanna Is. in the New Heb. I saw a flying fox coming from the direction of the Loyalties and making apparently for the New Heb. When cruising about the islands in small cutters I have several times seen flying foxes down in the sea with one wing held up to catch the wind and making exceedingly good progress down wind. The other wing is held out in the water as a support

to keep the animal afloat. They can apparently float thus for a long time without sinking though just how long I cannot say. They have some control over the direction of their course as I have seen one quartering the wind thus to make for the nearest land, and have seen them alter course to make for the ship. Falcons which prey on other sea birds often kill flying foxes when they are crossing the sea. I have actually seen one thus killed between two islands and the hawk managed to carry the weighty animal some three miles to the nearest land.

5. INSECTIVEROUS BATS There is at least one species of these on Lifu where it is very plentiful about the cliffs and caves where it roosts during the day. It is not so common in the centre of the island but is still plentiful enough. It roosts in small cavities in the coral rock of the central plains of the island and in the hollow spouts of trees and in dark corners amongst banyan roots. It makes its first appearance after sun-down, but before it is properly dark, but does not become plentiful till dark has arrived. It retires before the dawn and by the time the first streaks appear all have gone. There are very few mosquitoes on Lifu so the bat must feed on other types of insects which fly at night.

BRIEF NOTES ON THE INSECTS OF LIFU IS.

As far as this observer could see the insects on Lifu were the same as all the other islands of the Loyalties and very similar to Mare Is. except that butterflies were not as common on Lifu as they were on Mare Is. All other insects appeared the same to my unpractised eye. Unfortunately, lack of time precluded me making as large a collection on the island as I did on other islands, as I was not long on the island and my time was fully taken up

with birds. The scorpions, spiders, ants, etc. seemed the same as on Mare. The very poisonous red-backed spider is present and I could get no native to collect it for me, all being far too afraid to do so, so I asked them to find one for me and I would collect it myself. There was another spider they were afraid of, the rather repulsive flat, bare or hairy bodied one, a number of which I collected on Mare. As regards scorpions, unlike Mare Is. where the natives seemed not to fear the sting greatly, on Lifu they are very scared of it and I had to do all of the catching of them myself. Generally speaking, the natives of Lifu seem to regard the insects of that island with a great deal more respect as regards bites from them than do the natives of Mare or Uvea Is.

As there are no rivers, surface water or swamps on Lifu there are none of the types of insects which need that habitat on Lifu, as there are on Uvea. Lifu being a dry island and subject to droughts the insect life is accordingly such as would find those conditions suitable. (For fuller details see Bird Notes.)

BRIEF NOTES ON THE INVERTIBRATES OF LIFU IS.

The molluscs of Lifu Is. seem to be identical with Mare Is. There is the large conch-like forest snail which seems at some past date to have suffered some sort of disease which has wiped out millions at about the one time as all over the island there appears to be snails' shells all about the same age. The shell shows a small hole in the side as if some parasite not unlike a limpet (sea) has bored a hole in the shell on which it has been attached.

The French residents have introduced the French edible snail for eating and this is common about gardens etc. but does

not appear to have penetrated the forests to any great extent though it is common in native gardens in the forest especially if such gardens have European cabbages and litch like growing in them. Though for some years now natives have had little success with this vegetable because of the snail and the native slug.

There are the usual small tree and forest molluscs and they are fairly plentiful in the forests.

There is a large native forest slug which seems to be fairly common.

BRIEF NOTES ON THE REPTILES OF LIFU IS.

On Lifu there are the usual small sun lizards and a little larger form of green iguana, specimens of which were collected and forwarded. There is a large and a small species of Gecko lizard, the former being rare and the latter common. I saw none of the former but from native accounts they grow to about twelve inches in length and are very fat. The natives are very afraid of them though they know that they are nonpoisonous. The smaller and common one specimens were collected of and forwarded.

Snakes are common all over the island but I saw none more than about 3 ft. 6 in. in length. Natives say they do not know of them growing beyond five feet and specimens of between four and five feet are exceedingly rare. All appear to be the common nonpoisonous variety of rock python or carpet snake, common to all the islands of the Solomons and New Hebrides. The natives know of no poisonous varieties nor do they know of the reputed ground snake of the island of Mare Is. in the same group.

Sea-snakes are not uncommon about the coast and the natives speak of three varieties. Black and white ringed, red and white

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ringed and a brown and red spotted variety, which they are very afraid of and which is extremely deadly. Two years before my arrival on the island a native woman was actually attacked without offering provocation by one when she was fishing on the reef or searching for shell fish and the natives say she was dead within 15 minutes from a single bite she received. Natives said they do not believe the reptile hung on, merely gave an open mouthed strike and escaped. Fear may have played some part in the death as I know natives elsewhere are very afraid of the bite of this serpent. I did not collect this or any other sea-snakes on Lifu.

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